

# FLIGHT

The  
AIRCRAFT  
ENGINEER  
&  
AIRSHIPS

First Aero Weekly in the World.

Founder and Editor : STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

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DIARY OF FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in the following list :

Mar. 1	....	Lecture, "Helicopters," by Major F. M. Graen, before R.Ae.S.
Mar. 1	....	Entries close for the Schneider Cup
Mar. 15	....	Entries close for Dutch Height Indicator Competition.
Mar. 15	....	Lecture, "The Control of Aeroplanes at Slow Speeds," by Professor B. Melvill Jones, before R.Ae.S.
Mar. 23	....	Entries close for Gordon Bennett Balloon Race
Apr. 12	....	Lecture, "Some Controversial Points in Aircraft Design," by F. T. Hill, before I.Ae.E.
May 11	....	Lecture, "Experimental Flying," by Maj. M. E. A. Wright, before I.Ae.E.
June 25-30	....	International Air Congress, London
June 30	....	R.A.F. Aerial Pageant
July	....	Air Race for King's Cup
July 20	....	Gothenburg Exhibition
Aug. 6	....	Aerial Derby
Aug. 6-27	....	French Gliding Competition, near Cherbourg
Aug. 8-12	....	F.I.A. Conference, Gothenburg.
Sept. 23	....	Gordon Bennett Balloon Race, Belgium
Dec. 1	....	Entries close for French Aero Engine Competition

EDITORIAL COMMENT.



The  
Gothenburg  
Exhibition

WE have had occasion to refer, in previous issues of FLIGHT, to the desirability of Great Britain being represented at the forthcoming International Aero Exhibition at Gothenburg, Sweden. At the I.L.U.G., as the exhibition is called, there is not the slightest doubt that all three Scandinavian countries and Finland will send representatives to make a close study of the machines exhibited, and as all four nations are known to have the intention of placing orders after the closing of the exhibition, there would appear to be an excellent opportunity for very useful business propaganda as well as for maintaining British prestige. We have previously referred to the difficulty due to lack of funds. Few British aircraft firms are in a position to afford the expenses involved, although one might be well justified in taking the view that most firms cannot afford not to show. We have suggested that, apart from any action that may be taken by the Government (and we have hopes that the R.A.F. will be "showing the flag" at Gothenburg), it would be well worth the trouble and expense of the Society of British Aircraft Constructors to select from among their members a few representative firms with a view to sending several machines over. So far we have not heard of any steps being taken in this direction.

It will be easily realised that, if the S.B.A.C. do not take concerted action, there is the possibility that some financially strong firm will show their machines. Although that is certainly better than not to have this country represented at all, it has the disadvantage that it does not necessarily follow that the firm with the longest purse strings produces the best machines.

Commander Bird suggested at the Air Conference that this exhibition would form an excellent opportunity for sending over a composite squadron, consisting, we presume he meant, of various types of flying-boats and seaplanes, which could then be tested against one another under similar conditions. As the Scandinavian countries are all girt by the sea, and their inhabitants are, as a consequence,

sailors one and all, either professionally or as amateurs, there is little doubt that seaplanes would be favourably regarded by potential customers. In spite of the scant encouragement given to seaplanes in this country, British seaplanes and amphibians are unsurpassed, and it would, we think, be a great pity if the excellent opportunity of proving to the world what we know to be a fact were lost.

Surely we, as one of the alleged victorious nations, should be able to afford to compete commercially with our late enemy, not to mention our gallant French Allies. France, in addition to sending two air squadrons of her *Aviation Militaire*, has booked no less than 11,200 sq. ft. of floor-space. Germany has taken 12,400 sq. ft., Italy 2,600, and Czecho-Slovakia 2,200 sq. ft. Many of the best-known French constructors are exhibiting, while from Germany no less than four aircraft firms are sending machines. Professor Junkers is sending one machine. Claude Dornier is sending no less than four of his all-metal types, while the Albatros works will exhibit one, probably the commercial monoplane. Udet of Munich, who has recently constructed a light single-seater sporting model with 35 h.p. Haacke engine, will show one aeroplane, probably this type.

Italy will be represented by a Caproni machine, and the Czecho State Aircraft Factory of Prague are sending two. It would be a strange sight indeed if France and Germany were left to represent aircraft manufacturing Europe, without a representative from Great Britain. It is not as if this were an exhibition pure and simple. Flying will be in full swing at the aerodrome adjoining the exhibition, and here potential customers will see for themselves how the various types behave in actual flight. Thus the exhibition affords a unique opportunity of demonstrating our machines against those of other nations.

An international flying meeting, such as the Aerial Derby, the Gordon Bennett, the Coupe Deutsch, and the Coupe Schneider, usually bring together machines which are more or less of racing type. Useful as such meetings are, they have not, cannot possibly have, the same direct utility as a meeting which attracts machines of all sorts of different types, from commercial passenger carriers to single-seater fighters. Experience in South America has shown that orders are apt to go to the firms who have representatives and demonstration machines on the spot rather than to possibly better machines which are known only by reputation. It would be a sorry affair if the same thing should happen again so much nearer home, when an opportunity offers within flying distance of our aircraft works.

#### Medals for Gallantry

At its monthly meeting last week the committee of the Royal Humane Society made the following awards:—Bronze medals to Flight-Lieut. E. J. P. Burling, R.A.F., and Lieutenant Rupert de H. Burton, R.N., for their gallantry in saving a man under the most difficult and dangerous conditions when their flying boat was obliged to come down and was wrecked in a heavy sea off Swanage on September 12.

#### Anti-Aircraft Territorials.

New conditions of service have been prescribed by the Army Council for the Territorial anti-aircraft units of the Air Defence Brigades. Members of these brigades will be required to serve during a national emergency, when called upon, in the anti-aircraft defences of the United Kingdom, even though no order calling out the Territorial Army for actual military service is in force at the time. When so called out they will receive the pay and allowances issuable to a regular soldier of corresponding rank and arm and the gratuity given to Territorials on employment.

Members of an anti-aircraft artillery brigade will be re-

**R.Ae.C. Associateship** The establishment of an associateship open to all by the Royal Aero Club marks a new milestone in the life of our governing institution of sporting aviation. Full particulars of the new scheme will be found elsewhere in this issue.

It will be seen that associate membership will be obtainable for the very reasonable outlay of one guinea. Looked upon merely as a business proposition, this in itself should be an attractive offer, as the associate membership badge entitles the holder to free admission of all flying meetings and competitions held under the control of the Royal Aero Club. Thus an associate, if he only attends four meetings in the year, will have got his membership for nothing. As there are other benefits, such as short flights at Croydon for half-fare, and free use of the information bureau that is to be established at the R.Ae.C., the new scheme should prove very attractive, and should result in the joining-up of quite a large number.

As to the objects of the new branch of the R.Ae.C., these are various, but chief among them is the raising of funds for the purpose of offering prizes in connection with flying meetings. In the past the R.Ae.C. has in the main had to be content with the administration and award of prizes offered by others, the financial position of the Club not having been such as to allow of putting up any really substantial prizes. The result has been that several of our races, notably the Aerial Derby, have not attracted the foreign representatives who should have made the competitions really interesting.

It is to be hoped that the establishment of the associateship will result in such accession to the Club funds that really attractive prizes can be offered in connection with the various meetings to be held during the coming summer. Those who join will have the satisfaction of knowing that, as an addition to making a small investment which can only be regarded as attractive to them personally, they are helping the Royal Aero Club to assist aviation in a very practical manner by enabling it to encourage the participation in sporting flying. The whole scheme should have a sort of snow-ball effect, more members meaning greater interest, and greater interest meaning again better "gates," better "gates" enabling the Club to improve the programme, which in turn should increase the interest. If anyone is anxious to help aviation, but cannot afford to do so in any but a very small way, it would be difficult to imagine a better way of doing it than by becoming an associate.

quired to perform forty-five drills in the first year and twenty in subsequent years. In the Royal Engineers anti-aircraft battalions the requisite number of drills are forty and twenty and for signallers forty-five and fifteen. Men who served for at least six months during the War in an anti-aircraft unit, in the Royal Artillery or Royal Engineers, or in a signal unit will be regarded as trained and eligible for the trained man's bounty as soon as they are certified by their commanding officers to be otherwise efficient. Men with former service in the Royal Artillery, Royal Engineers, Signals Corps, or R.N.V.R., and with experience in anti-aircraft duties, may be enlisted up to the age of 45.

#### City of London Anti-Aircraft Territorials.

A MOVEMENT has been started at Lloyd's to raise an anti-aircraft battery forming one of the six batteries required in connection with the two anti-aircraft brigades of the City of London Territorial Association at Putney. Recruiting is being hampered by the delay of the War Office in passing the association's plans, submitted nearly a year ago, for the reconstruction of the old Yeomanry premises at Putney.



# A SUCCESSFUL AIRCRAFT DISPOSAL COMPANY MODIFICATION

## The D.H. 9B

LAST week we published a photograph of a D.H. 9A which had been modified by the Aircraft Disposal Company at their Waddon works. A few more particulars of this interesting machine are now available, and as they indicate what may be done by judicious alterations it is thought that their claim to interest has a wider application than the mere alteration to one certain type.

with the usual interrupter gear. On a Scarff gun ring in the gunner's cockpit are mounted two Lewis guns, while an additional gun is fitted in the gunner's cockpit, arranged to fire under the tail of the machine, a sliding panel in the floor of the cockpit covering the gun when not in use. It will thus be seen that the blind area has been reduced to a minimum.

The Air Ministry performance figures for the standard



The "Air-  
disco" D.H.  
9B: Side  
view.

To begin with, the speed and climb, with the same total loaded weight, have been very considerably increased. Thus at 3,000 ft. the maximum speed was found to be 130 m.p.h. with full military load, but without the three 230 lb. bombs. As the engine is a low-compression Rolls-Royce "Eagle" VIII, this is very good indeed. It may be assumed that the good performance is due in no small measure to the fitting of Lamblin radiators, coupled with the special nose cowling which surrounds the engine almost entirely. Thus again, the Lamblin radiators appear to have scored a success, and we have another confirmation of the way in which they enable extra speed to be obtained. When fitted to the Gloucestershire Aircraft Co.'s "Mars I" several miles per hour were added to the speed, and in France this type of radiator has long been used, almost to the exclusion of all other types.

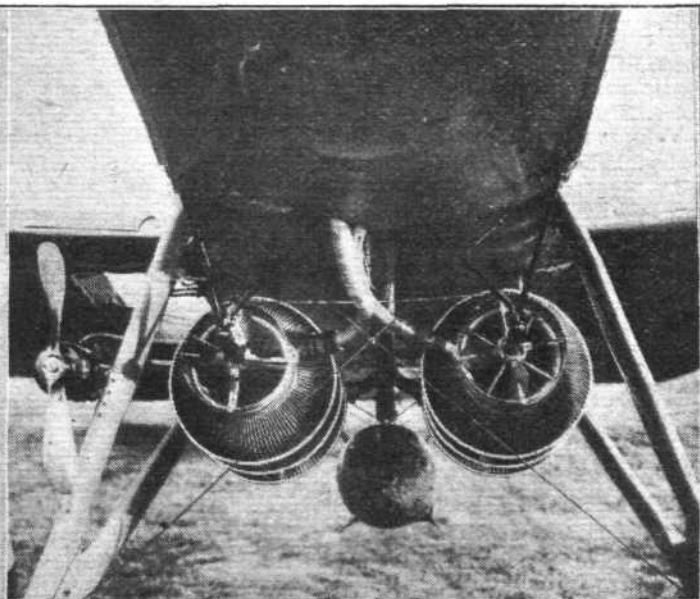
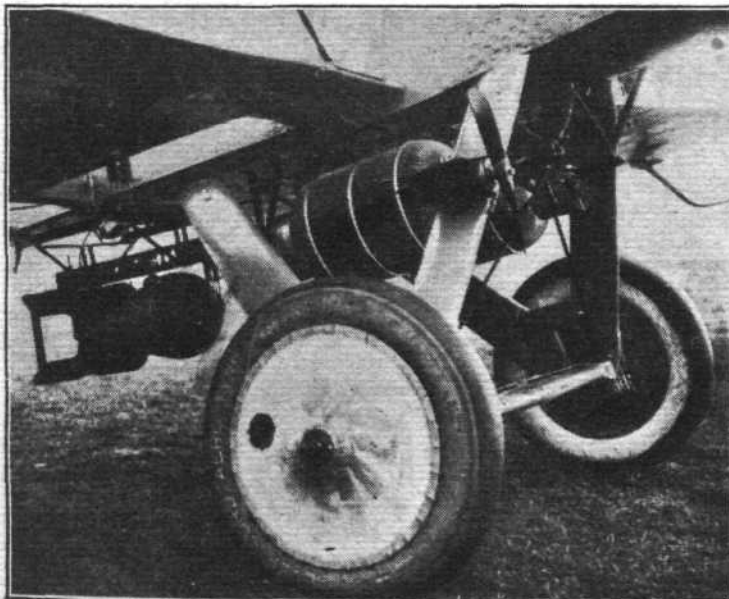
The "Airdisco" D.H. 9B forms a formidable weapon, what with its good performance and its armament, consisting of five machine guns and three 230 lb. bombs. Two Vickers guns are mounted in front of the pilot, and are, of course, fitted

D.H. 9A, with Rolls-Royce "Eagle" VIII engine, are as follows:—

Weight empty .. .. .	2,705 lbs.
Fuel and oil .. .. .	550 lbs.
Military load and bombs .. .. .	1,200 lbs.
Crew .. .. .	360 lbs.
Weight fully loaded .. .. .	4,815 lbs.
Speed at 10,000 ft. .. .. .	110.5 m.p.h.
Climb to 10,000 ft. .. .. .	20.6 mins.
Service ceiling .. .. .	14,000 ft.
Wing loading .. .. .	9.75 lbs./sq. ft.
Power loading .. .. .	14 lbs./h.p.

At present we have not the complete performance figures of the D.H.9B, but as soon as these become available we hope to be able to publish them for comparison with the standard machine.

Mr. Piercy flew one of these machines to Spain a short time ago, and presumably by now it has been taken over by the Spanish Government aviation section.



Two Views of the Lamblin Radiators on the A.D.C. D.H. 9.

# THE THIRD AIR CONFERENCE

## THE PROGRESS OF RESEARCH AND EXPERIMENT

By Air Vice-Marshal Sir W. Geoffrey H. Salmond, K.C.M.G., C.B., D.S.O., Air Member for Supply and Research, Air Ministry

*General Considerations.*—In his opening remarks the author briefly outlined the organisation for research and the parts played by the Air Ministry, the N.P.L., the R.A.E., the various experimental stations, and the aircraft and aero engine constructors. He then proceeded with a review of the work done during the past year.

Work of great value has been carried out in regard to wing sections, with the object particularly of improving the "get off" and landing speeds. At the present time the majority of machines have to carry an engine which must be run at maximum power for this purpose, but once getting off in the air the economic and customary flying speeds are obtainable at three-quarters throttle or even less. A certain amount of success has been met with in producing airplanes which are now very much more efficient in "getting off." It is our aim to produce a machine which would be able to leave the ground with the engine at three-quarter throttle, enabling a smaller engine to be used to run at the same power both for "getting off" and for flying, and resulting in a considerable saving of weight, economy in fuel, etc. As regards civil aviation, it may be advisable to explore the possibility, after testing an engine at the makers' rating of, say, 500 h.p., of devising some means, such as choking the inlet, to make it not possible for the engine in ordinary running to give more than 450 h.p., with the material advantages of longer life and lower maintenance charges.

The problems of airplane design which we are particularly considering may be divided roughly into three categories: Firstly, the single-seater fighter, where the essential quality is high performance at altitudes, say, above 20,000 ft. The next category, again a Service one, embraces a very large number of requirements, such as the amphibian, the boat machine, the reconnaissance machine, etc. The third category is the civil airplane, with which can be coupled the night bomber, troop carrier and ambulance machine.

With a single seater fighter it is necessary to run the engine all out in order to get the requisite performance, and it must, therefore, be fitted with some means of maintaining power at altitude. This difficult problem is much in our minds and is dealt with later.

Referring to factors of safety, the lecturer stated that it was, perhaps, a rather difficult matter to stress civil machines, since you may, for example, have a carrying capacity of ten passengers, and only take up three or four. For instance, where are these passengers to sit, if correct stability is to be secured? This matter is being investigated, and it is hoped shortly to lay down an authorised procedure. One line of investigation is to employ a small steel yard weighted to represent the weight of an empty machine. By hanging small weights on the yard representing the weights of baggage and passengers—i.e., the variable weight—the centre of gravity should be established.

These quite general considerations of the strength of the airplane lead to the investigation of fundamentals, of which that on materials comes first; but research by itself on materials must be useless unless ease of production and the possibility of bulk production is ultimately ensured. These considerations need emphasis; it is on these lines that present research work is being conducted.

Valuable results with steel, light alloys, and non-metallic materials have been achieved during the past year.

As regards fuel, very valuable research has been carried out, and decided advances have been made during the year. Once it is realised that of the total running cost of a machine at least one-half is due to fuel, it is evident that research in this direction should be accelerated. For example, the present price of petrol is about £35 per ton, whereas crude oil can be obtained for about £4 per ton, and the same weight of either of these fuels will give approximately the same horse-power. It is of great importance to civil aviation, and to the Royal Air Force, that encouragement should be given to schemes for the direct injection of fuel.

*Aero Engines.*—Although for military purposes engines giving as high as 1,000 h.p. and upwards are under development, for civil work there is little demand for an engine larger than from 400 to 450 h.p., and with this latter it is not desired, moreover, to run during level flying at a higher horse-power than about 350. Where one engine does not suffice, the tendency will probably be to use three. With

three engines the chance of a forced descent through engine trouble is comfortably remote.

In connection with supercharged engines, investigations are being carried out in respect to variable pitch propellers for use with same—an essential requirement. It is of interest to note that there is a demand for a variable pitch propeller for civil aviation—where very high-altitude flying is not customary—in order to obtain full advantage of the engine torque in "getting off." Here the variable pitch propeller would be equivalent to the gear-box of a motor-car. Investigations are being carried out with a view to introducing a variable gear in aero engines, in order to attack this problem.

Experiments are being made with an inverted form of the Napier Lion engine, in order to improve exhaust lead away, gravity feed and pilot's outlook.

Research work is proceeding on the connecting-rod big-end loading question.

One of the most promising events of the past year has been the development and use at the R.A.E. of a single cylinder of aero engine type to run on a "Diesel cycle." It is found that with a special shape of nozzle and "Solid injection" of shale oil fuel, a brake mean effective pressure of as much as 112 lbs. per square inch is obtainable, and that with an engine speed of 1,000 revolutions per minute; the fuel consumption under these conditions was 0.415 lb. per brake horse-power hour. As this fuel costs somewhere about one-eighth of that of petrol, it will be seen that this development, if it should prove to be capable of being pressed to a practical end, would have an enormously important effect on the future of civil aviation.

Work on direct fuel injection is being undertaken also by Messrs. Beardmore. The method of injection is different from that employed at Farnborough, inasmuch as in the latter, oil at from 3,000 to 4,000 lbs. per square inch is admitted through a timed valve, whereas in the Beardmore system the oil is injected by a jerk pump.

A step forward in full-scale experimental research has been made by the perfection of an instrument by means of which an aero engine can be tested in flight with an accuracy equal to that of the laboratory. This consists of the Callendar electric air flowmeter, which, when attached to the air intake of any multi-cylinder engine, measures the weight of air used independently of a knowledge of the pressure and temperature.

Efforts are being made towards the improvement of the magneto. As a result of investigations carried out, it is hoped to arrive at a design for a universal magneto equally suitable for all aircraft engines and all conditions of normal air operation. It seems likely that the introduction of cobalt steel magnets will greatly affect design. A point that particularly needs looking into to meet the temperature conditions of the Middle East is the mechanical, physical and electrical properties of moulded hard rubbers; this work is in hand. The characteristics of safety gaps at reduced pressures are under investigation with a view to the design particularly of a suitable safety gap for use with super-charged engines.

*Machines.*—Very rapid progress is being made in the development of the high-speed airplane.

In the study of aerodynamics, attention has been focussed upon improvement in control at low speeds; stalling is at present accompanied by such deterioration of control that straight flight can only be maintained by rather abnormal skill, and involuntary spins often result. We hope to find means of providing complete control of the aeroplane in the stalled state, so that aeroplanes may be flown with confidence at their lowest speeds, and the full speed range utilised. Various systems of lateral control have been and are being tried, but the greatest improvement has been obtained by the use of a very large rudder. An aeroplane has glided steadily under good control at an angle of incidence of 40 degrees. A system of varying aileron gearing, due to Mr. Hagg and the De Havilland Aeroplane Co., shows promise of improving the lateral control. The subject is being attacked from both sides—increasing the power of the controls and reducing the tendency of the aeroplane to get out of control.

In order to reduce the fatigue and effort of the pilot on large and long-distance machines, whilst at the same time he



"feels" the control, a hydraulic servo motor is being provided to operate the three controls. An experimental model has been thoroughly tested and has given good results.

The proposal to use airscrews in close tandem form (advanced by Capt. G. T. R. Hill at the last Air Conference) is being investigated by running two airscrews in this manner on the ground. So far no vibration troubles have occurred. Experiments which have been carried out indicate that a serious loss of efficiency is to be expected if airscrews be run at higher tip speeds than the highest now in use, 850 ft. per second, but below this speed no definite data have yet been achieved.

I referred last year briefly to the position of the Helicopter type of machine. There is little to add, except that a certain amount of work has been done, and that it is hoped that the time and effort expended will shortly be repaid.

**Metal Propellers.**—During the past year very considerable progress has been made in the development of the metal propeller. It may be said now that it has proved itself to be satisfactory for replacing the wood propeller hitherto in general use, and is already in production.

The main difficulty has been construction, and not the actual design. This difficulty is now overcome, and it can be safely said that a satisfactory metal propeller can be made for any type of aircraft, with an efficiency at least as high as that of the wooden one. Still further research is necessary with various aerofoil shapes, in order to determine the most efficient, and one, moreover, which is capable of convenient and rapid manufacture. Further study is also required on the methods of construction, observing that at the present moment the propeller relies to some extent on edge welding for its strength. It is necessary also to learn whether such propellers can be best made of tapered metal sheets or of a series of laminated sheets, a problem which will be investigated during the ensuing year.

The advent of high-powered engines has made the use of the metal propeller almost imperative for both service and commercial use, inasmuch as the metal propeller facilitates transportation owing to its blades being made detachable.

The variable pitch propeller follows as a natural sequence the development of the metal propeller. Hitherto the principal difficulty has been to secure adequate attachment for a wood blade to a metal centre. With the advent of the metal propeller, this difficulty has been removed, and it is thought that a satisfactory variable pitch propeller can now be designed to give the same degree of reliability as existing fixed pitch ones. Experiments are being continued.

**Undercarriages.**—The difficulties experienced in tropical climates have shown the weakness of rubber as an aircraft material, and steps have been taken to find a substitute, or, alternatively, to re-design the parts, eliminating rubber as far as practicable.

During the year a large amount of research has been carried out on Oleo undercarriages, and efforts have been made to eliminate the use of rubber in these.

Four types of undercarriages have been developed: (1) An Oleo dashpot combined with rubber buffers—that is, with rubber in compression; (2) an Oleo dashpot combined with a steel spring in compression; (3) an Oleo dashpot combined with compressed air; (4) a steel spring undercarriage with a variable leverage device. So far as experiments have gone, the Oleo with compressed rubber has proved entirely satisfactory.

The application of the Oleo principle to tail skids on large machines shows promise.

**Metal Wheels.**—This subject is being investigated with the object of eliminating rubber tyres and taking all shocks on the Oleo shock absorbing mechanism.

**Variable Camber Gears.**—Both research and experiment are being carried out with a number of variable camber devices which have been submitted for consideration. These divide themselves into: (1) The ordinary aerofoil fitted with an adjustable flap at the trailing edge; (2) The ordinary aerofoil fitted with an adjustable trailing and leading edge; (3) true variable camber gears which vary the actual camber of the aerofoil; (4) devices such as the Handley Page slot which fundamentally affect the air flow over the planes; (5) combinations of the Handley Page slot with the trailing edge flap.

A large programme of work on this is in hand, and some measure of success has been achieved. With regard to slots, tests and experiments are still continuing, and it has been demonstrated that this device gives an increase of lift coefficient of considerable magnitude, but is accompanied by an increase in drag. It is believed that this drag can be much reduced.

With regard to the trailing-edge flap, full scale tests have

been carried out at Martlesham Heath with a considerable amount of success. It has been demonstrated that the use of a trailing edge flap will reduce the landing speed of an aeroplane by approximately 12 per cent.

The other types mentioned are under test or about to be put under test in the wind tunnel.

**Metal Construction.**—Progress in the development of metal construction has been maintained, and considerable sums have been expended in this direction. There is no doubt that the metal airplane is now quite practical. Much work is still to be done from the point of view of cost reduction.

Experience has shown that not only is the metal airplane more durable than the wooden airplane, but that moderately-sized airplanes can be made lighter in metal than in wood. It is believed that this advantage can be continued in airplanes of larger dimensions, and the problem of producing a large airplane thereby much simplified.

**Gliders and Gliding.**—Inasmuch as a separate paper is being presented to the Air Conference dealing with this subject, it is not necessary for me to give much space to it. Great interest has been aroused by the recent gliding tests in Germany, France and England, and the possibilities opened up are of considerable importance. In the first place, it may save time and money in teaching flying; secondly, it may afford an advantageous method by which half or third scale models of machines may be tried in the air. There is the further consideration that it may add, in ways that cannot as yet be anticipated, to our knowledge of the nature of that atmospheric turbulence in all directions which Mr. G. I. Taylor has shown to be present in a normal wind, and the possibility of drawing upon the kinetic energy of such movements as a source of power. It will be remembered that in Hankin's book dealing with the soaring of birds over the Indian plains a suggestion was made that the birds were able to draw upon some then unknown source of power. My own experience when flying in India was at no time aimed at an investigation of this matter, but I very well remember that on one occasion, seeing some kites circling at a great height in the air, I took my machine to a point some thousands of feet below the circling birds, and found at once that I was in a rising current. One must not, however, ignore the theories which have been put forward that the eddy motions which accompany a wind to a greater or less degree have a considerable kinetic energy of motion which, if tapped, would explain the soaring of birds, on the one hand, and afford, on the other, a possible means of power supply for gliders.

**Navigation and Instruments.**—In dealing with this section Sir Geoffrey first referred to an important item in the year's work, i.e., the development of the new type of magnetic compass, and outlined the requirements and developments of compasses. He also referred to an alternative kind of magnetic compass known as the inductor compass, which has been tried by the U.S. Government. In this a little generator, the armature of which revolves in the earth's horizontal magnetic field, produces a minute electric current which, by certain ingenious mechanical arrangements, is arranged to indicate to a pilot whether he is flying to port or starboard of a course previously laid down. Should the introduction of steel construction into modern aircraft render the ordinary compass impossible, such a device as this might prove useful; so far, it does not appear that this need is likely to arise.

Proceeding, he stated that an important navigational problem is the provision of means whereby the pilot of a single-seater machine can obtain whilst in flight a sufficiently accurate knowledge of the velocity and direction of the wind to enable him to lay his course correctly. The solution of this problem is being attacked, and preliminary flights show great promise.

Night flying and the ever-increasing radius of action of civilian aircraft enhances the importance of the question of the accuracy with which these distances can be navigated. By day, provided that suitable land were always in view, the problem would not differ materially from the ordinary dead-reckoning navigation used over comparatively short distances. The pilot should always be prepared to take advantage of favourable winds and conditions which may prevail above clouds, and to fly for several hours on a correct course without viewing land. Either directional wireless or astronomical observations can be used. A sextant which experience has shown to be capable of being employed under air conditions is the R.A.E. bubble sextant, which refers to the altitude of a heavenly body to a gravity-controlled bubble.

**Fog Landing.**—This problem is one of the most troublesome we have to face. At present an aircraft can be led to within approximately two miles of an aerodrome by directional



wireless, but within this radius further position finding becomes difficult. A scheme is being tried at Croydon whereby the position is rapidly taken by sound and the information transmitted to the aeroplane by wireless, thus relieving the pilot of the necessity for asking for his position when he is much occupied with flying the machine. Moreover, the lapse of time between taking his position and giving him the information is reduced. The problem of actually landing through the fog remains, and we are now investigating the possibility of laying a cable carrying an electric current round the aerodrome convenient for an aeroplane in flight to follow. The aeroplane will carry apparatus capable of detecting it and of measuring the energy received. The amount of such energy gives an inverse measure of the height. By this means, it is hoped to enable the pilot to locate the actual confines of the landing ground, and, finally, to glide down, even in conditions of very low visibility, with an accurate knowledge of his height at any given moment. The disadvantage of this method is in having to carry apparatus which will only be used for a few minutes on a small minority of flights. Electrical methods of fog dispersion are being tried on a small scale, and have given certain results, but to do this on a large scale is a more difficult problem.

*Aerial Survey.*—The value of aerial survey is largely dependent upon the accuracy with which the camera can be held vertical and at a known constant height. To determine the probable degree of accuracy, a series of experiments has been carried out by Prof. B. M. Jones and Major J. C. Griffiths; the method consists in photographing a strip of flat and conspicuously marked country. From a comparison of the photograph and a map of the country, the tilt of the camera and the height above ground may be checked by noting the relating distortion of opposite sides of the plate and by a comparison of the scales of map and plate.

## GLIDERS AND THEIR VALUE TO AERONAUTICAL PROGRESS

By Colonel ALEC OGILVIE, C.B.E., F.R.Ae.S.

*Early Experiments.*—The interest of man in the flight of birds goes back to very early days and although "to fly" was commonly considered to be an impossibility until quite a few years ago, numberless men watching birds sailing along with motionless wings have expressed disbelief in the impossibility of such a feat for human beings. There can be no doubt that in several cases, some many hundreds of years ago, attempts to glide met with partial success, and nothing is more astounding to a student of aeronautical history than the immensity of the effort in money, in time and in brains of a high order of excellence, which has been put into abortive experiments in aeronautics.

These experiments ranged from model flying machines which were frequently successful to full-scale efforts which were invariably failures. The reason for these failures is to be found in the essential difficulty in making the first flight. As it was not thought possible to work up gradually to a successful flying machine, numerous problems of lift, resistance, power, stability, control and starting all had to be solved simultaneously, and failure in any one particular caused failure in the whole. It was, in fact, necessary for the flying machine to reach a considerable degree of development before it could work at all.

About 1875 a German and an engineer, Otto Lilienthal by name, became convinced, after studying the flight of large birds, that the principal obstacle in the way of human flight was lack of practice in the art of flying, and after a series of laboratory experiments lasting several years, with wings of various shapes and curvatures, he embodied his results in a glider or rather a series of gliders with which he made at least two thousand flights between 1891, when the full-scale experiments commenced, and 1896, when he was accidentally killed. The importance of the work of this man to the progress of aeronautics cannot be over estimated. In fact, he is justly considered to be the originator of the modern flying machine.

When the Wrights took up gliding, they did so purely from a sporting standpoint, but they showed from the beginning that they had a very clear grasp of the problem, and that they appreciated that the heart of the difficulty was control in the air, both lateral and fore and aft. Their machines were simply-made biplanes of ample strength, and the design of which progressed from year to year as knowledge of the requirements was obtained.

This problem of control was far harder than they had anticipated, and it took these two very exceptional men three years' work with gliders and models before they dared to attempt a power-driven machine.

Considerable progress has been made in the art of aerial photography since 1914, and photographs have now been taken from 8,000 ft. in which it is possible to distinguish birds feeding on the ground. A film camera, replacing plates, is now under development, which, if successful, will save weight and space. At present we are dependent for our supply of film on sources which are outside the British Empire, a factor which must be taken into account before a film camera can be standardised.

Foreign-made flying and engine instruments for test purposes have now been replaced for the first time by a complete series of British instruments of equal or greater accuracy.

*Wireless.*—Progress is being made in the use of fixed wireless aerials in aircraft, which have great advantages over trailing aerials, and are particularly applicable to large airplanes. They should be of special utility to civil aircraft. Such aerials are operative even when an aircraft is taxiing, and will facilitate "position finding" under conditions of very low visibility, and also fog landing when a trailing aerial could not be used.

Progress in directional wireless continues, the plains of Iraq and the Middle East generally proving ideal for this work, the errors in bearings from natural causes being negligible. The abolition of accumulators in aircraft on account of their weight is a difficult problem, which has received much thought during the past year. The two main difficulties are to drive wind-driven generators at constant revolutions irrespective of the air speed of the aircraft, and to provide a source of electric supply to aircraft when stranded. Both these problems are now well on the way to solution.

In the concluding part of his paper the author gave a review on the research work carried out on materials—fatigue of metals, use of light materials, etc.—and on inspection methods.

The deduction which the writer would wish to make from this is that the control problem might well not be solved at this present day, if it had not been for the availability of the glider as an instrument to get at the fundamentals of the problem in a simple, inexpensive and reasonably safe manner; since the fundamentals are known, their application to attain practical results is quick and easy.

*Development of Practical Flying.*—During the War period lives, brains and money were freely spent to meet the rapidly increasing requirements, and the expansion in the four years was to be measured in hundreds of fold. If the War had continued for another year or two, it was to be expected, judging by the rapid rate of progress, that the aircraft weapon would have predominated over all others.

From the technical standpoint the necessity of maximum, performance in speed, in climb, and in weight-carrying was so paramount that other aerodynamic qualities were perforce neglected. It was futile to spend much time improving any particular type of machine, in the direction of better control, or of greater economy or safety, when the same result or nearly the same result could be obtained by putting a more powerful engine into the same machine or by designing another machine to take the bigger engine. Demands upon the pilots for greater skill in landing and in controlling their machines were promptly met.

Another noteworthy result of this intensive activity in design was the standardisation of such wing sections as gave specially good results from the performance point of view.

Judging from some recent trials, details of which the writer is not at liberty to give, it would appear that it is fully time that the designers of this country should seriously turn their attention to wing sections other than the standard ones. There is a clear piece of evidence that very considerable improvements in all-round results can be obtained with a thick-sectioned monoplane over the thin-sectioned biplane standardised in this country.

*Present Position of Aeronautical Development.*—It must be understood that the writer is looking at this matter from the point of view of aircraft for civil transport purposes. From this standpoint, the present position of aeronautical development cannot be considered to be satisfactory.

Civil aircraft are not sufficiently safe in the event of a breakdown of the motive power, necessitating a forced landing. They are also much too expensive to buy, to run and maintain in running order, and until very considerable improvements can be effected in this respect it cannot be claimed that they are transport vehicles of a really commercial character. It is hoped that these remarks will not be misinterpreted.

The writer has a firm belief in the future of civil aviation, and in the capacity of our aircraft industry to find an answer to the many problems involved.

The size of commercial aircraft is so great that the cost of building machines for experimental purposes is practically impossible to private firms, apart from the cost of the large quantities of fuel required, of the maintenance parties and of the large shed accommodation and other overheads.

The position is therefore somewhat of a deadlock. It is impossible to make rapid progress towards a really sound economic aircraft without a large volume of experimental work, the cost of which, if conducted with full-scale civil aircraft is so great as to be altogether beyond the capacity of the transport firms or of the industry.

Colonel Ogilvie then reviewed the recent experiments in gliding, but as these are familiar to our readers they are not repeated here.

**Limitations and Usefulness of Gliders.**—There are possibilities in the use of gliders for purposes of training pilots, and there are certainly possibilities in the development of small sporting machines of 15 to 20 h.p., capable of horizontal flight with 5 h.p., and doing 100 miles or so to the gallon, but the real immediate value of gliders lies, as it always has done, in the opportunity they afford of technical experiment in a simple and inexpensive manner.

In experiments with engine-driven aeroplanes, the horsepower of the engine and the efficiency of the propeller are always difficult to estimate exactly. The detail design has to be carried out with care and attention, in order to keep the percentage weight of the structure within fairly close limits, while the cost of the experimental work is almost prohibitive to private firms. On the other hand, with gliders the motive power, which is the force of gravity, is perfectly definite in amount and always reliable, and for many purposes the machine can be built in a simple, rough and ready manner as long as the external form is correct.

As indicated above, there are two main technical problems in the commercial aeroplane of the day, and it is suggested that solutions of either or of both are more likely to be found by means of experimental work with gliders than by other means. The first is the increasing of aerodynamic efficiency, to enable considerably greater loads to be carried for the same power or the same load for less power. The overall

efficiency, the ratio of lift to drag, or in other words the inverse of the gliding angle of the commercial aeroplane of the day is about 8 to 1; in some cases even less. To put the result in another way, about 60 h.p. is required to carry each individual passenger for the usual 3-hour journey at a speed which is necessary to combat the normal wind conditions. This is obviously a very high figure, and gives an indication of the reason for the high cost of aerial transport.

The second problem for solution is the improvement of controllability at low flying speeds, so that in the event of an engine stoppage, the aeroplane can be landed in awkward fields with greater safety than at present. It is well known to aeronautical engineers that an aeroplane, the stalling speed of which has been tested to be, say, 50 miles per hour in good weather on a large aerodrome, is never, in the event of a forced landing, glided in at a speed of less than 60 m.p.h. This additional 20 per cent. over the stalling speed adds greatly to the difficulties of the landing and to the shock in the case of an accident, and would be entirely unnecessary if the pilot had an aeroplane over which even in gusty weather he had complete control right down to the stalling speed. This difficulty is such a commonplace among pilots that it does not occur to them to worry about it, but it is a problem to which a great deal of attention is being paid and to an attack on which the Aeronautical Research Committee is devoting a considerable amount of the resources at its disposal. The recent gliding competition at Itford Hill showed how much room there was for improvement in the controllability of the aeroplanes entered, and instilled a belief that other competitions would cheaply and quickly effect such improvement. There can be little doubt that these are only two instances out of many where we have good reason to expect substantial progress in aeronautics by means of experimental work with gliders.

The writer would conclude by an appeal to business men who are interested in civil aeronautics, whether from a financial point of view or otherwise, to put up prizes and so to stimulate competition among a large number of brains towards a solution of the problems which must be solved before commercial aviation, ultimately to be a necessary bulwark of the country, can become the practical economic proposition, which is the earnest hope of all present.

## THE DISCUSSION

THE second day of the Air Conference, February 7, was devoted to a discussion of the papers read on the first day. The morning session had been set aside for a discussion of the papers read by Gen. Brancker and Comdr. Burney, and His Grace the Duke of Sutherland, Under-Secretary of State for Air, presided.

His Grace expressed regret that it had not been possible to find time to complete the most interesting paper on "Seaplanes," by Mr. Fairey, and said he could not help feeling that it would be a good thing another year to extend the Air Conference to three days or even four. With regard to policy, His Grace thought that the Secretary of State for Air had said all that it was possible to say at the moment, and confined himself to giving an assurance that the papers and discussions would receive the deep and interested attention of the Air Ministry. The Government fully realised that aviation had one of the strongest claims for consideration, and he looked forward to a sympathetic policy being laid down, and to a great future for the aviation industry. He then read a telegram from a former Under-Secretary of State for Air, Lord Londonderry, who very much regretted his inability to be present. The Duke of Sutherland then called on Mr. G. Holt Thomas.

Mr. G. Holt Thomas expressed the hope that any criticisms which he made would be received in a friendly spirit. Referring to Comdr. Burney's paper he said he could not see how the Navy could do without airships, and that the only question was, on the commercial side, what could best be done. The difficulty was that we had no data on airship work, and could not estimate their cost, earning capacity, speed against head winds, etc., in the same way that we could those of aeroplanes, of which we had now had three years' experience. He did not want to see the aeroplane robbed of such funds as might be available.

Mr. Holt Thomas congratulated Gen. Brancker on his paper and especially on the improvements in wireless, etc. He trusted, however, that the Air Conference would not become simply a record of the past, but would also deal with the future. Sir Samuel Hoare had said that he stood in the midst of experts. The Air Parliament, as His Grace had called it, was not meant to be a committee of experts,

but a meeting of business men who would take a great interest in the subject. He felt that the Air Conference would not do very much good unless it passed resolutions to which the Cabinet would pay some attention. There had been three Air Conferences, three Lord Mayors had opened the Guildhall to the Conference, there had been three air demonstrations, and His Grace was the third Under-Secretary of State for Air who had sat in the chair and expressed pious hopes, but very little had been done towards establishing Imperial Air Mails. What we had to consider was what civil aviation would really do for British industry. We paid too much attention to passengers. We should see really to what utility we could put a form of transport which had now become a thoroughly practical one. The United States had taken a practical course. They said that air transport was the fastest form of transport in the world, and then they started air mail services, from New York to San Francisco.

It had been said that the London-Paris route was no good. He did not agree, because that air service did things which no other form of transport could do. If it were desired to get Gen. Brancker's paper to Paris in four hours it could be done by telegraph, but it would be very little quicker than the air service, and would cost 2½d. per word, or about £500. He thought that there should be enough business houses in London and Paris to keep the service going if it was put in the proper way. If you wanted to telegraph Gen. Brancker's paper to Australia it would cost about £7,500 by cable, and £3,750 at deferred rates.

The first thing the Air Ministry put before the C.A.A.B. was a service to Baghdad. Perhaps it would not have been judicious to say this service was not a suitable one to consider. From a practical point of view it was like considering a service to Ascot races, starting half-way down and arriving 10 miles from the racecourse.

Sir Samuel Hoare had referred to the shortage of money. That was not his (Mr. Holt Thomas's) experience. Some years ago business men in London were willing to put up a million. In 24 hours a million was underwritten for the cross-Channel services. The money was not put up with the idea of making large profits, but the business men concerned looked upon the aviation services as a national



deal. He was certain that if the British Government spoke out its policy it would have the country behind it, and the money would be forthcoming in five minutes. All the Dominions had expressed themselves willing to help in a great air service from one end of the Empire to the other. He would like to see the three operating companies come together and form a really important corporation. You want, he said, a great national or Imperial corporation, with the Government working hand-in-hand with it.

He had been chairman of a committee in America, and then laid down that passengers did not pay except in motor cars. The committee went into the matter carefully, and came to the same result. By carrying light freight, there was sufficient traffic to run several planes every day to all great cities in America. He pointed out that sending money by air resulted in a great saving. Thus, in one instance one saved two days' interest. If the Government would take up the question of air mail services to Australia, etc., air mails would pay for themselves after a time. Freight also would always pay wherever you could beat the train in the matter of time.

Mr. Holt Thomas then proposed the following resolution: "In view of the necessity to increase rapidity of communication within the Empire, and in view of the progress made by other nations in civil aviation, this conference calls on the Government to give due and immediate consideration to the foundation of an air mail throughout the Empire."

Lord Gorell said that, as he had taken up a considerable amount of the time at last year's conference he did not propose to say much. With regard to Comdr. Burney's paper, he thought the title was misleading, and that the paper ought to have been called a disquisition into the supremacy of aircraft over seacraft. He had been very interested in the figures given by Comdr. Burney relating to the efficiency of aircraft, and he had never seen it stated so plainly before that 16 airships could be produced as cheaply as one battleship, or that 9 airships could do the same work as 60 cruisers, or that in searching 1,000 sq. miles of sea the cost by airship would be £1 5s., while the cost by light cruisers would be £77. These were interesting figures.

Lord Gorell criticised the attitude of going to the Admiralty about an airship scheme. He felt it was a rather unusual proceeding that when, for example, you wished to take over Mr. Jones's house you went to Mr. Smith with a proposal to do it. In Comdr. Burney's paper there was not one mention, from start to finish, of the Air Ministry. He felt that the paper was using airships as a stalking horse to attack the control of the air by the Air Ministry. He did not agree with the use of the expression self-supporting. Under the scheme outlined the State would have to guarantee the interest. Without such guarantee it would be impossible to obtain the necessary financial assistance. He did not think that anyone who had gone into the question thoroughly was not wholly in favour of an airship service, but while the present financial conditions existed he would much prefer to see the money spent upon the development of heavier-than-air craft.

With regard to Gen. Brancker's paper, Lord Gorell said that many were sceptical that in five years time civil aviation would be on a paying basis. Gen. Brancker had referred to the subsidisation of the three firms as a temporary scheme. He hoped it would not be temporary except that we had not as yet had any indication from the Government as to their future policy. The three routes (to Paris and on, or the southern route, to Cologne and on, or the eastern route, and to Amsterdam and on, or the northern route) were the three main arteries along which all air transport of the future must go. England had no possibilities of going west, at least until it became practicable to fly across the Atlantic. Reference had been made to the problems of speed, cost and safety. He would like to emphasise two others: comfort and noise. Although progress had been made, there was still room for improvement of the former, while he did not know in how far it was possible to silence the drone of the engines.

Lord Gorell said he agreed entirely with Mr. Holt Thomas that too much stress was laid on passenger traffic. Concentration should be rather on transport of goods. He hoped we should hear something about air mails from Gen. Wilkinson of the G.P.O. Why was it, he said, that it was impossible for the G.P.O. of this country to take the same view as the American Government with regard to sending letters by the quickest mode without surcharge to the public? He thought it was the duty of the Post Office, without asking the sender, to send mails by the quickest route. With regard to the Civil Aviation Advisory Board,

Lord Gorell did not think that Capt. Guest had been given enough credit for its inception. It had only produced one report, but that had entailed a tremendous amount of work. It ought to be stated in this connection that two people were entitled to the greatest credit for that work: Gen. Brancker and Sir Geoffrey Salmond.

With regard to the opening remarks of the Secretary of State for Air, Lord Gorell thought that his remarks were both hopeful and helpful. The way in which he spoke of his attitude of mind was most encouraging. Whether we agreed with the present Government or not, we must agree that the constant changes in Ministers coming new to a very intricate subject was regrettable. We might hope that the air was now becoming one of the three subjects which may be regarded as being above party considerations. Without a definite stable air policy we could hope for no security.

Mr. F. Handley Page referred to the two maps exhibited, one showing the European airways and the other air lines in Australia. He thought that the latter showed that progress had been made at the other end of the Imperial air route, and hoped that at the Fourth Air Conference we might see between those two maps a map showing the Imperial route actually in operation. With regard to the map of European airways he thought that the routes dealing with Central Europe were built on volcanoes, and that if the southern route were developed there might be better prospects as this could be laid over countries with more stable governments. Turning to the present, Mr. Handley Page said that he was glad to say that for the past two years his own company had made no claim whatever on the insurance companies for accidents to machines. That, he thought, was an important thing, and served to give the passengers confidence.

On the question of the type of traffic to cater for, he disagreed that passenger traffic was not what was required, and pointed out that the great international passenger train company existed solely on passenger traffic, and was, he believed, a financial success. Passengers would always pay more than goods, their time being more valuable.

He was pleased to learn from the Secretary of State for Air that operating companies were to be given a longer tenure, and hoped that, apart from subsidising the operating companies, research would not be lost sight of.

Major-General Seely said that if he were asked what would most help civil aviation on the technical side, he would say the elimination of noise. He said he was told by his technical friends that it had been found that the brain could only attend to a certain number of different things at one time, and this number was greatly reduced when a great deal of noise was present. Pilots were given more and more "gadgets" to look after, and it therefore appeared that the elimination or, at any rate, reduction of noise would greatly help. Another direction in which he looked for progress was in the development of the seaplane.

Mr. Ashbolt, Agent-General for Tasmania, said he viewed with uneasiness the frittering away of the asset represented by the airship material, and hoped that no further dispersion would take place until a definite decision on the Burney scheme had been taken. He regretted the long delay in publishing the Amery Report, and urged its publication at once.

Sir Alan Anderson, President of the Chamber of Shipping, thought that there was one point on which a critical note might be introduced with advantage. He referred to the statement by Sir Samuel Hoare that all realised that military needs must take precedence over commerce. He (Sir Alan Anderson) rather thought that here was a case when the longest way round might prove to be the quickest way home, and pointed out that it had never been proved in the past that the nation which failed to take the lead in commerce was able to sustain the armaments needed to prevail in war. He was convinced that the nation which took the lead in air commerce would in time of war be master in the air.

Sir Alan thought the difficulties surrounding airships could and should be surmounted, and said that, personally, he had great belief in the airship, having made trips in four different types. If, by an airship service, we could reduce distances between dominions we should have done the very greatest service in the world. By taking advantage of the trade winds the speed of airship travel could be greatly increased. He was certain that if it could be proved that airships could do what was claimed for them there would be no lack of people wanting to travel by them.

Capt. Instone was sorry to hear that the subsidy scheme was still regarded as temporary. It seemed so to happen that every time there was an Air Conference we were always at the fag end of a "temporary" scheme. This state of



affairs not only affected the operating companies, but also the manufacturers.

He was glad to learn that the International Convention was getting busy with new routes, but he thought that, when he compared what was being done at Croydon, for foreign air lines no less than for our own, with the conditions abroad, he felt that other nations ought to consider their obligations to afford the same facilities as they obtain when they come to Croydon.

With regard to Czecho-Slovakia, he said that that country had shown the greatest willingness to see British aircraft flying over their country, because they felt that by opening these routes by air trade was being developed. General Brancker had expressed the hope that Germany would join the convention. He had not, however, stated what would happen if Germany did not join.

Capt. Instone said he knew that the official view of propaganda was that this should be done by the private firms themselves. He thought, however, that it would not be a bad idea if the Air Ministry could get post marks on letters saying "Travel by Air."

Admiral Mark Kerr said there had been a lot of talk about civil aviation as having been got up for the benefit of trade. This was not so. Indirectly trade would benefit, but commercial aviation was the one great backing to military power. He had recently been speaking to the military attaché of a friendly power, who had said: "We do not care what happens now, we have command of the air." He suggested that the only way to get anything done was to "frighten the people, and let them frighten the Government."

General Williamson, of the G.P.O., said it was not quite fair to blame the G.P.O. for lack of interest in air mails. They had had a very attractive summary of all that was being done by air mails printed and issued to offices of business houses. General Williamson commented on the decline in the use of the air mail to Paris, but called attention to the increasing success of the parcels post. The Cairo-Baghdad service was the most successful, and there had been an increase, in the December quarter of 1922, of 600 per cent. over the December quarter of 1921. Saving in time about three weeks. He concluded by pointing out that over short distances air mails were of little use. By covering long distances and flying at night, great improvement was possible. Letters posted at end of business day in London should then reach Copenhagen, Stockholm, Berlin, Hamburg, Switzerland and northern Italy next morning, and he thought it was quite legitimate to look forward to that development.

Sir Henry White Smith called attention to the need for research and experiment, pointing out that money spent on foundation work of this kind would be more than repaid by greater economy in subsidies necessary. At the moment we did not know whether we should use small machines or large ones, low speeds with heavy loads or high speeds with low loads, heavy engines with infrequent overhaul or light engines with more frequent overhaul. He suggested that a sub-committee should be set up and funds placed at their disposal, the Government setting aside sufficient money for this work on commercial development, in addition to military work. He concluded by referring humorously to the constant procession of new air ministers, and hoped that this rapid change would slow down. There was, however, the advantage that in this way many more were educated in aviation.

Commander Burney stated that many of the criticisms of his paper had cancelled each other, and that he would, therefore, only deal with one point, raised by Lord Gorell. With regard to the suggestion that he (Commander Burney) had, by his paper, re-introduced the old controversy and friction between two departments, he said nothing could have been further from his thoughts. From the practical point of view the difficulty was to get the money. He had, therefore, analysed the situation as clearly as he could, and had to find some big spending department who could save money in other directions by taking up airships. As the Admiralty spent 60 millions a year, and as the Navy was, moreover, responsible for our trade routes, he went to them with his proposal. With reference to the Air Ministry, he went to them first of all, and was in negotiations with them for months. They had no money. They said so. Their reply was that they thought it was better to spend what money was available on heavier-than-air-craft, and that, much against their will, they had been obliged to shut down on airships.

General Sir Sefton Brancker, Director of Civil Aviation, said that he had asked for criticism and had received an undeserved shower of bouquets. He thought both Colonel Ogilvie and Mr. Fairey harped too much on engine failure.

He thought we should get the engine absolutely reliable so long as it was properly looked after. He believed in the future of the large flying boat, but it might be rather a long way out in the future. One boat was now under construction which tended in the direction of the large boat capable of being moored out.

Regarding the London-Paris route, General Brancker said that obviously this was the highway to the south, but that so long as it only went as far as Paris it was not as useful as it should be. When it became an important section of a longer route, it would be a different matter.

On the matter of subsidies, Lord Gorell and Captain Instone had regretted the statement in his paper that the present scheme was temporary. The £600,000 set aside for cross-Channel services in 1921 was getting near an end, and by April, 1924, would be used up. It was, therefore, necessary to formulate a Government policy before one could say that anything was more than temporary. He quite agreed that noise was one of the troubles which we had to get rid of. Air sickness was another. Proper ventilation and heating arrangements would do a great deal towards eliminating air sickness, and a large twin-engined machine was now on order from Messrs. Vickers, in which a series of experiments on passenger comfort would be carried out.

Mr. Handley Page had referred to the southern route as the most promising. He (Mr. Handley Page) had had the choice of three routes, and had chosen the southern. It was now up to him to prove that he was right. He would like to compliment Handley Page Transport on the absence of accidents, and on the fact that good organisation had resulted in the reduction of insurance premiums.

Captain Instone and Sir Henry White Smith had mentioned the fact that we did not yet have a commercial aeroplane. He agreed, and realised that the private firms had not the money to go into research and experiment as to the most suitable types of machine. The Air Ministry was going to call for tenders, much as was now done with military machines. As one did not really know what sort of machines would be required, the specifications had been kept rather vague. Three different types would be asked for: The first was for a machine which would be economical to run on the European airways. The second for the Indian route. This machine would have to be able to cover 500 miles non-stop against strong wind. The third type should be capable of flying from London to Malta without landing. The latter was not a good commercial proposition, owing to the large amount of fuel which had to be carried, but he thought it was aerodynamically possible.

With regard to Germany joining the International Convention, the position could be divided into two sections: the occupied area and the rest of Germany. As soon as Article 5 was ratified, it would be possible for us to treat separately with Germany, and he thought there was little doubt that an agreement would be reached. As regards Cologne and the occupied area, if Germany joined all difficulties would be at an end. If she did not, well, then, things were in such a state there that he really did not know what was likely to happen.

On the question of parachutes General Brancker thought their use was chiefly military, and he did not think that in any of the accidents that had occurred to civil machines parachutes would have been of any use. He thought there were only two occasions on which it might be imagined that parachutes would be useful. One was in case of fire on board, and we had now reached a stage where it was justifiable to think that this would never occur in any British machine. The second was in the case of collision. At present the danger of this was not great, but as we got more and more machines into the air it was a problem which had to be faced. It appeared that the only way to make use of a parachute in that case would be to release the whole cabin with all the passengers on one large parachute, and that was a problem which Mr. Calthrop was now trying to solve.

The Duke of Sutherland said he had only been in office three months. He came to aviation quite new, and he was learning a little, and was more than a little interested. He assured his audience that anything he could do to help aviation would be done. He was finding it supremely interesting, and thought he would find it still more so as time went on. He thought the future of civil aviation depended entirely for commercial success upon the raising of sufficient capital on a long period of years, and that some such agreement was absolutely essential for that purpose. He concluded by stating, amid general amusement, that he did not want it to be thought that Commander Burney was referring to himself and Lord Gorell when he stated that gas bags could be changed in a very short space of time.



## AFTERNOON SESSION: DISCUSSION ON TECHNICAL PAPERS

At the afternoon session on February 7 the Chair was taken by Sir Wm. Joynson-Hicks, Director of Overseas Trade. A letter from Sir Samuel Hoare was read by the Duke of Sutherland, in which the Secretary of State for Air regretted his inability to be present, but promised that full weight would be given to the suggestions made at the Air Conference.

Sir Wm. Joynson-Hicks expressed his thanks to the Secretary of State for Air for giving him the privilege of occupying the chair, and said that, although his activities were now along other lines he still followed with interest all pertaining to aviation. He appealed to the authorities to see to it that, however much it might be necessary to economise, research would not be allowed to suffer. Ten years ago, Sir William said, those who ventured to prophesy speeds of over 100 miles per hour and altitudes of 20,000 ft. were looked upon as fools. The next ten years, he thought would show as great development. He thought we were in for an age of terrific discoveries in electricity, particularly in radio electricity, and asked his audience to think of the possibilities of aeroplanes controlled by wireless, loaded with bombs, which could be sent to any place which it was desired to bomb. No pilot would be necessary.

Professor L. Bairstow said that the remarks of Sir Geoffrey Salmond in his paper that there is no limit and no horizon to the view of research were true not only in aeronautics but in all branches of scientific research. In spite of that fact, however, research had its milestones and its landmarks. The particular one under review at the moment was the subject of safety and reliability in aircraft. Our weakest point, he thought, still lay in lack of facilities for full-scale research, and as a remedy we had Sir Geoffrey's assurance that the Air Ministry were prepared to consider the construction of special aeroplanes for the study of stability and control. This would mean, he said, that for the first time in history we should have an aeroplane in which the spare load could be used for experimental instruments.

The contact between the Aeronautical Research Committee and the Air Ministry had during the past year been made much closer by the arrangement by which the Secretary of the Committee was allowed direct contact with the Department of Research at the Air Ministry. The wind tunnel work at the N.P.L. was particularly complete and the cost was relatively small, somewhere about £30,000 per annum. The relation between model and full scale was now such that we could give a very good prediction of what would happen with the full-size machine. For instance, tests on models in the Froude tank had shown, in three instances, that certain designs of seaplanes would have failed if built and flown. The object of model research was the provision of efficient aircraft suitable for commerce and for the defence of the country. The test of full-size aircraft came with its use.

As a member of the Accidents Investigations Committee he had had an opportunity of seeing results from a particularly interesting standpoint, and he was impressed by the serious consequences to an aircraft due to some in itself trivial cause. For instance, a choked petrol jet might result in engine stoppage and a forced landing. Pilots would naturally land machine as slowly as possible, but might overdo it, and in 80 per cent. of crashes the result was stalling and a nose dive into the ground. A consideration of the problems might lead to several lines of enquiries. For instance, one might look for a better carburettor jet, but this obvious remedy was only superficial. Another line of enquiry would be into the possibility of such control that a machine would not dive into the ground. In this connection it was of interest that a machine had now been glided at an angle of incidence of 40 degrees, and what was conjecture a year ago was now an accomplished fact. On the strength of that we might now see hopes of making an aeroplane controllable even when stalled.

Professor Bairstow regretted that an officer who had taken a distinguished part in these flying experiments had been posted elsewhere. It was the general opinion of those best qualified to judge that further research in this direction would suffer by his going, but it was, of course, realised that someone else would benefit by the change. He could only remain where he was and continue the work by sacrificing his career in the R.A.F.

He expressed his appreciation of the facilities, asked for last year, for designers to see more of their machines before they were taken over by the Air Ministry. About 3½ hours' flying time was now allowed to makers before the machine was handed over. He concluded by stating his opinion that the future was hopeful, and that experiment and research were now tending upwards, so that research workers might hope shortly to be again in a position to give important assistance to the Air Ministry.

Commander James Bird congratulated Mr. Fairey on the extremely able and impartial way in which he had dealt with his subject. There was, he said, no more controversial subject in aeronautics at the present moment than boat *versus* float. He thought a most important point brought forward in the paper was that dealing with the lack of proper full-scale tests under varying conditions. During the last year much had been done to rectify this want, but more might be done. It should be remembered that the seaplane had never had the same chance to develop as had the aeroplane, and what designers and constructors wanted was to see their products used and tried out under all possible conditions, and, most important of all, to be told of such of the results of the trials as were applicable to design and construction, as soon as possible. Commander Bird thought the forthcoming exhibition at Gothenburg would form an excellent opportunity of finding out the kind of information required, and that if the Government could see their way of sending a composite squadron a great deal of good would be done.

With regard to the float *versus* boat controversy Commander Bird could not agree with Mr. Fairey as to the disadvantages of the boat. The high centre of thrust of the boat type could be got over, and he pointed out that the Supermarine boat which won the Schneider Cup was equally stable engine on and engine off. On the matter of damage he thought the risk of total loss was smaller in the boat than in the float seaplane, because boats usually had their steps built on, and even if one or more departments were punctured the main hull was usually still intact. In the case of the seaplane damage to the bottom of one float would result in the machine turning turtle. He agreed with Mr. Fairey on the question of handling, but not with the suggested remedies, which, he thought, would be far too costly. He considered that the problem was relatively simple. Amphibians could look after themselves. Small seaplanes could either carry or ship and unship small wheels for beaching operations, while large boats must be made to remain afloat and only go into dry dock or on to a hard as ships did when cleaning and overhaul was necessary.

In conclusion, Commander Bird urged that the greatest possible attention should be given to the training of crews and station personnel in every branch of seamanship. He also had a few words to say on the subject of engines. At present engines were supplied for seaplanes exactly as they were for aeroplanes. Engine makers should give far more attention to waterproofing and to such points as the position of air intakes where water spray would not be sucked into the carburettors.

Dr. Richard Glazebrook pleaded for more support for fundamental research. By way of illustrating the kind of work he had in mind, he quoted from a paper read by Mr. Baker before the R.Ae.S. a passage relating to the importance of research being well in advance of present requirements. On the matter of airships and airship services Sir Richard said he would like to know if it was the view of those who urged the establishment of such services that their technical knowledge was sufficient to allow them to go ahead. He said there were very many technical problems connected with large airships which required investigation, before a service could be started on a satisfactory basis.

Major F. M. Green challenged the statement in Sir Geoffrey Salmond's paper that the fuel cost was one-half of the total running cost of an aeroplane. He did not think the fuel cost was anything like as high as that, but it was still very considerable. Then there was a small point in Commander Burney's paper. It was stated that, at the lower temperatures at which the hydrogen-burning engines worked the life of the engines would be longer. Major Green was not aware that the life of an engine was inversely proportional to the temperatures of the exhaust gases.

On the question of using gliders for obtaining data on power-driven machines, Major Green thought that there were many difficulties in the way. A very favourable locality was required, and then after each flight the glider would have to be brought back to the top of the hill. He thought it was better to continue research on the lines we had already laid down. He pleaded for more expeditious publication of the results of tests. He said he realised that scientists were loth to publish anything until they were quite sure the results were correct, but thought that if the results were published immediately, and the conclusions drawn from them published later, it would be of the greatest assistance to designers.

Commander Holden Richardson, of the U.S.N. Air Service, said he once spent nearly 60 hours in the boat hull of N.C. 3 in the Atlantic, the machine having come down with engine



trouble during the trans-Atlantic attempt in which Commander Reid succeeded. They succeeded in reaching land, but the experience was not one which he would like to repeat, although it certainly gave them a good opportunity of studying the seaworthiness of the hull. These hulls touched upon research because the hull of the N.C. 3 was originally different, but model tests in the tank at the Washington Navy Yard indicated that the hull would have been a failure as originally designed, but that by making certain alterations in the lines, as suggested by the model tests, resulted in an improvement of 30 per cent. in the running. On the question of boat *versus* float, they had, he said, also plenty of controversy in the States. Commander Bird had referred to the lack of a suitable place where different types could be tried against one another under identical conditions. He fully agreed with the necessity for this, and said that in America he had had a pair of floats built to demonstrate their inferiority to the boat, "and the darn things went fine." He also thought that experience in service was extremely important, and assisted by practical reports of what was wrong.

General Bagnall-Wild, Director of Research, pleaded for closer co-operation between the various institutions dealing with aeronautics and those of the automobile engineering world, and thought considerable mutual benefit would be derived.

Professor Melville Jones, Professor in Aeronautics at Cambridge, said he proposed to speak on the subject of safety. What was wanted was the sort of safety you have in a train, and he did not think that we had yet approached that stage in the air. Although he was well aware that by making the landing speed as high as possible economy was attained, he pleaded for lower landing speeds. On the one hand, you had the economy, which could be calculated. On the other, you had safety, which could not be calculated. If left to individual decision it was inevitable that the choice of minimum speed would be too high. He was not certain how the subject should be tackled, whether by Government action or by agreement between companies, but something would have to be done. As to what the maximum landing speed should be, he had not the nerve to say, he stated, but he thought it should certainly be below 50 m.p.h., say somewhere between 50 m.p.h. and 30 m.p.h. His reasons were purely from personal experience. He knew that a modern pilot would not hesitate to go over a wooded district in an Avro whose engine was rickety (supposing it *was* rickety, he did not, of course, suggest that an Avro had such an engine), because he knew that he would not be killed in case of a forced landing, owing to the low landing speed of the Avro.

On the subject of turn indicators he had spoken at the last Air Conference, he would speak of them again this year, and he proposed to refer to them again next year until they were fitted on all commercial machines. We still were not fitting them on our air liners, and it was essential for safety that we should fit them.

Sir Alexander Denny, President of the British Engineering Standards Association, stated that, from forty years' experience of model experiment in relation to ships, he felt confident that the model-to-full-scale problem would be solved so that in aeronautics, as in the case of ships, one could be certain of the model prediction. He concluded by referring to the valuable work done by the B.E.S.A., and stated that the Association would always be pleased to accept work from firms of the industry if asked to do so, but they would not initiate it unless they were asked.

Mr. F. Handley Page said he agreed with Professor Jones in the matter of landing speeds, but that as regards turn indicators he thought Professor Jones was hardly up-to-date as turn indicators *were* used. His firm had tried three different types. The difficulty was to get a suitable instrument, and the trouble was in the indicator itself rather than in its use.

With regard to the per cent. structure weight curve in Mr. Fairey's paper, he did not know where he (Mr. Fairey) got the information, but the figures given were incorrect. The actual figures of structure weight were considerably lower, and if they had been used they would have altered the shape of the curve considerably.

Major-General Sir Sefton Brancker, Director of Civil Aviation, deprecated the agitation for lower landing speed. The cure was not lower landing speeds but reliable engines. Actually, he said, a much more difficult problem than landing was that of getting off with a heavy load. Speed was what the aeroplane had to sell, and it would not do to cut it down. The present subsidies were paid, on the London-Paris route, on the flights completed in less than four hours. On several occasions the Handley Page machines had taken more than

four hours for the journey, and the subsidies had to be cancelled for those flights. On the subject of turn indicators General Brancker was most emphatic that he had not been able to get a satisfactory instrument. They might work all right in the hands of a scientist, but did not in the case of an ordinary practical pilot.

Air Vice-Marshal Sir Geoffrey Salmond said that after reading his paper he had been rather conscience stricken because he did not talk very much about the things that had been left undone. There were many things which were only a milestone ahead, and which he hoped would be done during the present year. We had not succeeded in the matter of gearing for multi-engined machines, and we had not succeeded over the question of the thick wing. But we were progressing. And we had not yet succeeded in the production at a commercial price of the all-metal machine, but he hoped we would get it, because we were going to pay special attention to it this year. With regard to the discussions, he had been struck by the way all questions of the difficulties in civil aviation came down to research again. Safety and reliability were the two great aims. Under the former head ability to land in a confined space was the prime thing, and reference had been made to the controllability below the stalling angle.

As regards reliability, the question of fog was the most important problem, and one which would be tackled during the present year. We had been tending toward the three-engined machine, and that also was a subject which would come forward this year. Another thing wanted was a cheap commercial engine of about 450 h.p., which would not need to be so light as the service engine, but which would give the reliability asked for by General Brancker.

Parachutes was another problem. The difficulty was that we had not yet the 100-per-cent. parachute, and until we had it was not desired to issue it to pilots except in case of war. Three types of parachute were under experiment, and some of them had been issued to training units. All machines now being produced for service had provision for a parachute.

On the matter of gliders, Sir Geoffrey did not agree with Major F. M. Green that we should leave them out of the research programme, because we did not know what the possibilities of gliders were.

Commander Bird and Commander Richardson had spoken on the subject of tests to decide the question of floats or boats. The Air Ministry had arranged for trials, but one of the machines met with a fatal accident. In any case, he thought, service requirements would probably prevent the universal adoption of one or the other.

Colonel Alec Ogilvie thought it was a mistake to expect complete engine reliability and to lay down any definite limit in low speed with that in view. With regard to tenders for aircraft for civil aviation, he thought it was a mistake for these to be issued by the Government. It would be better if the tenders came from the users themselves, the operating companies, direct to the aircraft manufacturers.

Mr. C. R. Fairey, in replying to the criticisms raised, said he quite agreed that both types of seaplane would ultimately survive. Without advocating either type he would like to comment on one or two things Commander Bird had said. He quite agreed that one could get a flying boat to trim both engine on and engine off, but to do so necessitated a large negative load on the tail. In the matter of puncturing a hull, and providing bulkheads, this was as easily done in a float as in a boat. In a boat, if you had to dispose of gear, you could not make a water-tight bulkhead much forward of the planes. He welcomed Commander Richardson's contribution to the Conference, and did not really think there was any difference in their views. The question was one of compromise, and the behaviour of a boat under power and drifting was totally different.

Regarding his curve of structure weight, Mr. Fairey said that the points from which that *average* curve was plotted resembled a cloud of dust. What he had tried to arrive at was a general average density. As regards Mr. Handley Page's complaint that too high figures had been taken for his machines, they were obtained from official records of performance. In any case, although the points might fall differently on the curve they would not alter the *shape* of the curve. His contention was that you could shift the curve in either class of machine up or down, but you could not alter the shape. An aeroplane would necessarily go up in structure weight as the size increased, whereas this was not so yet with the flying boat. The distances from point to point round the world that we wished to travel were not placed with any consideration for the natural laws of aeroplane design, and the larger you made the seaplane the smaller its percentage structure weight. Hence his vote went to the seaplane.



# ROYAL AERO CLUB ASSOCIATESHIP

A VERY attractive departure has been made by the Royal Aero Club in the creation of Associates of the Club. The scheme, whereby substantial privileges are offered for a nominal subscription of 21s. to all those joining up as associates, is launched with the chief object of helping to advance British air supremacy by enabling the Club to obtain funds for the furtherance of this great new art. It is open to all, and embraces free admission to aviation meetings, free flights to Paris, Brussels, or Amsterdam and hotel expenses for one week, and free training in flying. The Royal Aero Club, which has been established over twenty-one years, is justified in putting forward this expansion by reason of its objects being to stimulate interest in flying, promote flying contests, assist the development of gliding, and to secure uniform legislation relating to aeronautics. The privileges are as follows: (1) Associateship of the Royal Aero Club; (2) Badge of Associateship; (3) free admission to all Aviation Meetings organised by the Royal Aero Club, on presentation of Associateship badge; (4) passenger flights at half price with approved firms where the full fare does not exceed 10s. per flight; (5) representation on Council of Associates; (6) access to the Bureau of Information.

To encourage workers for the common good, the Club makes the following offers for 1923 to those who will help:—

**Free Associateship.**—(a) Persons introducing five Associates will have free Associateship for one year, entitling them to receive all benefits and privileges.

**Free Trip by Air (or Rail) to Paris, Brussels or Amsterdam.**—(b) Persons introducing twenty Associates will be entitled to a free trip by air (or rail) to Paris, Brussels or Amsterdam and return, provided advantage has not been taken of offer (a).

**Free Trip by Air (or Rail) to Paris, Brussels or Amsterdam, and Agreed Hotel Expenses for one Week.**—(c) Persons introducing fifty Associates will be entitled to a free trip by air (or rail) to Paris, Brussels or Amsterdam and hotel expenses for one week, provided advantage has not been taken of offers (a) and (b).

**Free Training in Flying.**—(d) Persons introducing 200 Associates will be entitled to free training in flying for a Pilot's Certificate, Class A (this costs about £125), provided advantage has not been taken of offers (a), (b) or (c).

**Note.**—In the event of the person introducing Associates as above not wishing to partake personally of any of the offers, he or she may nominate some other person to receive them.

## GLIDING, SOARING AND AIR-SAILING

Those wishing to get in touch with others interested in matters relating to gliding and the construction of gliders are invited to write to the Editor of FLIGHT, who will be pleased to publish such communications on this page, in order to bring together those who would like to co-operate, either in forming gliding clubs or in private collaboration.

THE French gliding meeting at Biskra has resulted in several very good flights, not only as regards duration, which is now a relatively unimportant phase of gliding, but also in the matter of altitude attained, etc. On January 30, Lieut. Thoret, on a Dewoitine monoplane, remained in the air for 3 hrs. 55 mins. Adjutant Descamps was second on that day with a duration of 3 hrs. 47 mins.

On January 31, Barbot was first away on a Dewoitine, followed a few minutes later by Descamps. Half an hour later, Thoret got away, all three pilots being mounted on Dewoitine monoplanes. Barbot reached a height of 200 metres (650 ft.) above his starting point. Thoret, shortly after the start, got blown against a rock, damaging his machine but himself being uninjured. He immediately went up in the Hanriot school machine, and did 15 mins. with a passenger, of course with his engine stopped. Adjutant Descamps landed after being in the air for 4 hrs. 11 mins., owing, it is stated, to indisposition. Barbot stuck it until 5 in the afternoon, when he landed after being up for 8 hrs. 36 mins.

OWING to light winds, no further gliding of any note was done until February 5, when Descamps flew for 2 hrs. 46 mins., and Thoret for 1 hr. 58 mins.

ALTHOUGH the wind was very light on February 6, Fronval took up the Peyret tandem monoplane glider, but was only able to do straight glides, the wind being insufficient for keeping this machine in the air. It is of interest that Descamps on the same day was able to stay up for 4 hrs. 12 mins., showing, what was suspected at Itford, that, although the Peyret machine has ample control, it is not such a good glider as the more orthodox monoplanes.

FEBRUARY 7 proved to be the last day on which soaring was possible. The day was marred by an accident to Barbot, fortunately without serious consequences to the pilot. It appears that a gust of wind caught the machine and blew it against some rocks. Barbot received a few bruises, but the machine was rather badly damaged. On the same day Descamps, during a flight of 3 hrs. 4 mins.' duration decided to try to get above the gusty lower air, and, his machine being a very efficient one and the wind fairly strong, he actually reached at one time an altitude of 630 metres (2,065 ft.) above his starting point, as recorded on his barograph. It is of interest to note that during his stay at Biskra Adjutant Descamps' total time in the air is 18 hrs.

The last days of the week were characterised by very light airs, and no flights of importance were possible.

It appears that Maneyrol did not go to Biskra, after all, but was content to remain at Vauville, near Cherbourg. Here, on February 18, he made his first attempt at a distance flight. With the wind blowing from 15 to 18 metres per sec. (34 to 40 m.p.h.), he covered a distance in a straight line of 2.875 kilometres (a little over 1½ mile), remaining in the air for a little over 7 mins. Maneyrol expressed himself satisfied as to the possibilities of extended flights, but in this connection it should be realised that the Peyret is probably not the most suitable type. A very efficient machine would be able, for a given wind velocity, to reach a greater altitude, and consequently should be able to make a longer glide, or even rise sufficiently high to enable it to glide across a gap between two ranges of hills. This is, of course, what competitors for the Selfridge Prize of 1,000 guineas will have to do in this country in order to cover the 50 miles. It is understood that Maneyrol's flight was an acceptance trial for the Levasseur Prize of 15,000 francs, to be awarded by the end of the year to the French pilot who has covered the greatest distance in a straight line, the minimum required being 10 kilometres (6.2 miles). The start for this competition must be made from a cliff in France, but the landing may be made on the beach either in France or abroad. This means that a pilot may, if he is able to do so, start from the French coast and land in England.

FEBRUARY 10 will go down in history as the first occasion on which a motorless flight was made in Belgium. The monoplane glider used in the flight was built by M. Poncelet, who is, we understand, a foreman in the works of the S.A. Belge de Constructions Aeronautiques. The wind was only very light, and as the flight was made over the Brussels aerodrome, or, in other words, over flat country, no extended flight was expected nor attempted. With the rubbers pulled out to half their length only the machine got off well, and made a hop of about 120 yards, piloted by Lieut. Simonet, who is a test pilot in the Belgian Army Air Service. During the short flight the machine was found to be well balanced, and seemed to answer its controls readily.

ON February 11 there was a flat calm, and it was not though advisable to launch the glider in the ordinary way. Tests were, however, made with towing the glider behind a motor-car, and hops of 300 yards or so were made, the machine reaching a height of 40 to 50 ft. The pilot took the opportunity to test the rudder and ailerons, doing left and right-hand banked turns. We understand that Lieut. Simonet is now going to the Ardennes to look for a suitable place where he can do some real gliding and soaring. Next week we hope to be able to publish photographs of the Poncelet glider.



# LONDON TERMINAL AERODROME

Monday evening, February 19.

THE night-flying experiments have been continued during the last week, but, owing to the abnormal weather, only one completed flight was made, a D.H.9 flying from Lympne to Paris on Friday night. Other nights both the D.H.9 and a Bristol fighter of the R.A.F., have carried out local flights, and also flights from Croydon to Lympne—the weather being, for the most part, good on the British side and indifferent in France.

The ordinary day services have suffered from the weather, and on two days during the week no machine got through on a scheduled journey.

## Experiments in Road-Making

THE Air Ministry are making experiments with various road-making materials on a series of new alighting platforms which are being pushed out through the mud in the Customs' area. Several of these are, in fact, now being made, radiating from the central tarmac, and each one is being constructed of different material in order to get experience in how these various substances stand up to the tearing effect of iron-shod skids on heavy machines.

The Air Union—the combined company of the C.M.A. Air Lines and the Grands Express—have had a busy week with their goods traffic, and have sent more machines than any other company. When their machines have been unable to get through, owing to the weather, the goods have been sent by passenger train and boat, and brought straight to Croydon for

Customs' formalities and distribution, as it is found that even this is a long way quicker than the ordinary methods of dispatching goods and leaving them to be dealt with by the ordinary land traffic organisation.

Today the Daimler Airway machines on the London-Manchester route was to have commenced calling at Birmingham in connection with the British Industries Fair which is being held on Castle Bromwich aerodrome; but the weather was so bad that the inaugural service had to be postponed. Major-General Sir W. S. Brancker is attending the opening dinner at the Fair, and is to give his views on civil aviation to the commercial men who will be gathered there.

On Saturday there was some dislocation of air traffic, but in spite of the weather the Handley Page Company managed to get a machine through in each direction between London and Paris, being the only company to maintain their continental services on this day, although Daimler ran the service between Manchester and London to schedule.

The Handley Page people are now completing, in their shed on the 'drome, the conversion of a W.8 into a 16-seater. When the machine is ready for service—and I understand other W.8's are to be similarly converted—it will provide accommodation for 14 passengers in the enlarged saloon, in addition to the pilot and wireless operator. These machines will, of course, be extremely useful in coping with the summer influx of passengers.

A Bristol fighter, *en route* for Greece—which country it is to reach by air—arrived at the 'drome yesterday. It is, I gather, the first of a batch of Bristols for Greece.

## THE LONDON-CONTINENTAL SERVICES FLIGHTS BETWEEN JANUARY 28 AND FEBRUARY 17, INCLUSIVE

Route (including certain diverted journeys)	No. of flights*	No. of passengers	No. of flights carrying		No. of journeys completed†	Average flying time	Fastest time made by	Type and (in brackets) Number of each type flying
			Mails	Goods				
Croydon-Paris ...	38†	63	13	28	35	h. m. 3 7	Breguet F-CMAI (2hr. 16m.)	B. (2), D.H. 9 (2), G. (9), H.P.W.8B. (3).
Paris-Croydon ...	33§	73	9	27	26	3 1	H.P.WSB G-EBBI (1h. 57m.)	B. (3), D.H. 9 (2), G. (9), H.P.W.8B. (3).
Croydon-Brussels-Cologne	16	48	7	—	16	3 54	D.H. 34 G-EBBR (3h. 8m.)	D.H. 18 (1), D.H. 34 (3).
Cologne-Brussels-Croydon	12¶	46	8	—	11	4 33	D.H. 34 G-EBBR (3h. 47m.)	D.H. 18 (1), D.H. 34 (3).
Croydon-Rotterdam ...	7	9	7	7	7	2 40	Fokker H-NABM (1h. 57m.)	F. (4).
Rotterdam-Croydon ...	6	8	5	5	5	3 16	Fokker H-NABR (2h. 44m.)	F. (4).
Manchester-Croydon-Amsterdam	11**	25	2	3	10	5 32	—	D.H. 34 (4).
Amsterdam-Croydon-Manchester	14††	24	3	4	13	—	—	D.H. 34 (4).
Total for three weeks	137	296	54	74	123			

\* Not including "private" flights.

† Including certain journeys when stops were made *en route*.

‡ Croy.-Lym. 6, Lym.-L.B. 9.

§ L.B.-Lym. 2, Lym.-Croy. 1.

|| Croy.-Brus. 3, Brus.-Col. 5.

¶ Col.-Brus. 3.

\*\* Man.-Croy. 5, Croy.-A'dam. 2.

†† A'dam.-Croy. 5, Croy.-Man. 7.

Av = Avro. B. = Breguet. Br. = Bristol. Bt. = B.A.T. D.H.4. = De Havilland 4, D.H.9. (etc.).

F. = Fokker. Fa. = Farman F.50. G. = Goliath Farman. H.P. = Handley Page. M. = Martinsyde. Sp. = Spad.

Vi. = Vickers Vimy. Vu. = Vickers Vulcan. W. = Westland.

The following is a list of firms running services between London and Paris, Brussels, etc., etc.:—Co. des Grandes Expresses Aériennes; Daimler Hire, Ltd.; Handley Page Transport, Ltd.; Instone Air Line; Koninklijke Luchtvaart Maatschappij; Messageries Aériennes.

**Incidental Flying.**—Mr. Perry and Capt. Stocken have been very busy during the above period testing various machines at Croydon for the Aircraft Disposal Co.

## Junkers for Russia.

It is reported from Moscow that the Junker Aeroplane concern has just concluded an agreement with the Bolsheviks which will permit it to construct its machines on Soviet soil and to maintain a regular air service between Sweden, Russia and Persia.

## French Aeroplanes Sold to Russia?

ACCORDING to M. André Tardieu a number of French aeroplanes have been sold to the Russian-Soviet Government.

With regard to these transactions, M. Tardieu urged the Foreign Affairs Commission of the Chamber of Deputies to ask M. Poincaré to state whether the sales were made with the Government's approval and how many machines had been sold. The Commission, however, refused by a majority of three to put these questions to the Prime Minister. M. Tardieu stated that it was useless to aid Poland by a loan of 400,000,000 francs if at the same time her possible adversary obtains French aeroplanes.

## NOTICES TO AIRMEN

### Denmark : Seaplane Customs Ports

1. THE following places in Denmark have been declared customs ports for seaplanes :—

(a) *Esbjerg*.—Latitude 55° 28' N., Longitude 8° 26' E.—Seaplanes can, under all conditions, alight in and take off from the fairway, west of the Trafikhavn. Customs clearance is carried out at the north end of the Trafikhavn, where craft can, at ordinary heights of the tide, run up the beach, which consists of fine sand. At low tide the depth of water in the north and south parts of the Trafikhavn is slight.

(b) *Aalborg*.—Latitude 57° 03' N., Longitude 9° 56' E. Seaplanes should take off and alight in the fairway east of the two bridges, between which alighting and taking off

is prohibited. Customs clearance is carried out in the same part of the port. Aircraft may only be moored to one of the buoys placed at the south side of the harbour, east of the bridge.

(c) *Frederikshavn*.—Latitude 57° 26' N., Longitude 10° 32' E. Aircraft are advised to alight in the lee of the harbour. In case of strong north-east to south winds entry to the harbour is difficult for aircraft, and in such cases pilots are advised to make for Aalborg harbour. Customs clearance is carried out in the west inner harbour.

2. *Previous Notices*.—Paragraph 2 of Notice to Airmen No. 105 of 1920 is modified by paragraph 1 of this Notice. (No. 16 of 1923.)

## PERSONALS

### Married

Flying Officer GEOFFREY W. HEMMING, D.S.C., R.A.F., son of Mr. and Mrs. W. J. Hemming, of Grove Hill, Worcester, was married on February 7 at St. Comgall's Parish Church, County Down, to DOROTHY MAY, only daughter of Mr. and Mrs. R. J. Woods, of Princetown Lodge, Bangor, County Down.

### Death

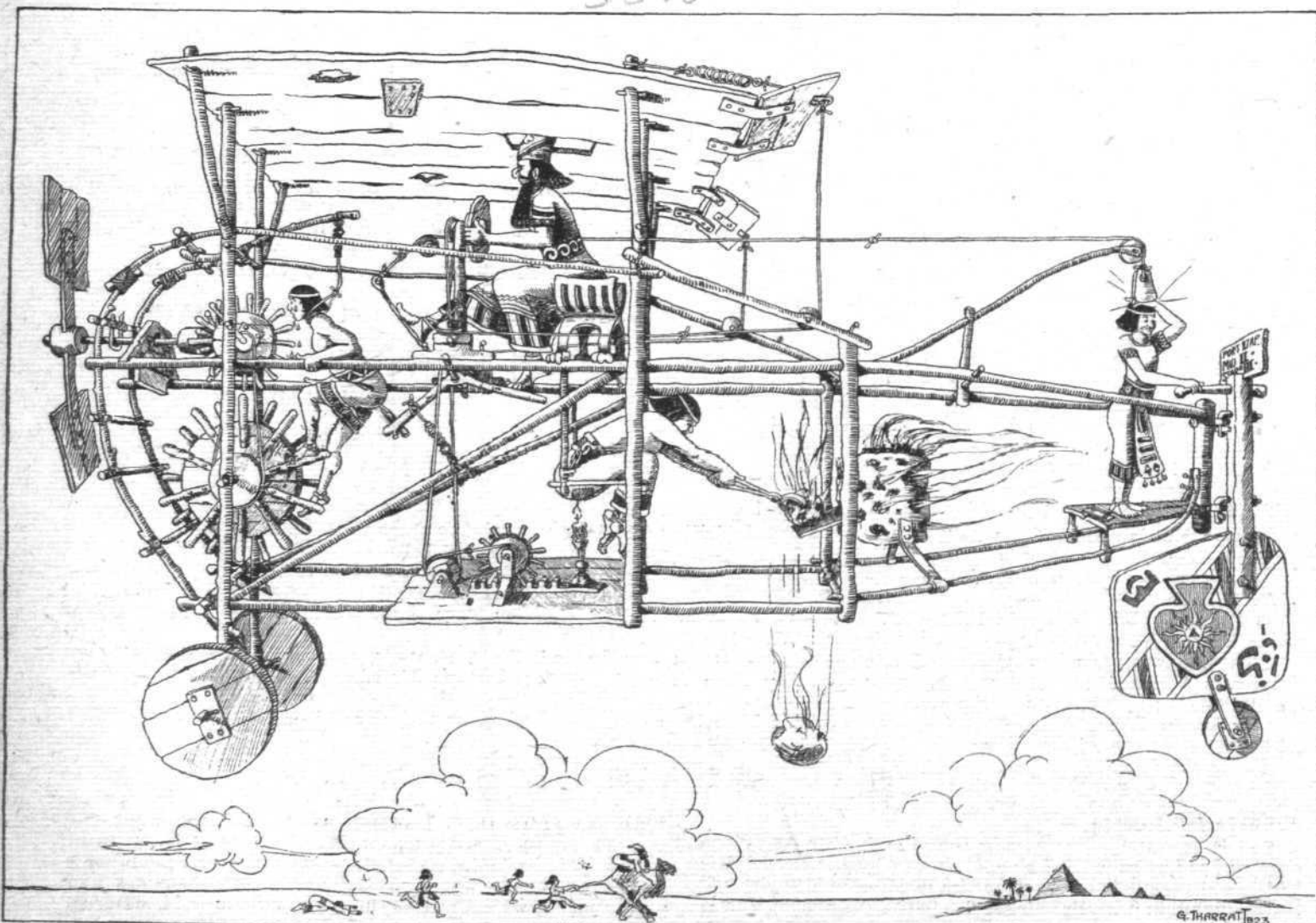
CHARLES LIONEL HAWTREY HICKS, late Captain, R.A.F., who died on December 27, at 979, Almirante Brown,

Temperley, Buenos Aires, was the youngest son of Captain John Hicks, R.N., of The Moorings, Sevenoaks and The Oaks, Halifax, Nova Scotia. His age was 39.

### Items

The will of Capt. JOHN HARTSHORNE COOPER (late R.F.C.), age 26, of Culland Hall, Brailsford, Derby, and of Daramic, Wyoming, U.S.A., who was killed in a motor accident at Brooklands, has been proved at £92,372.

Lieut. Aviateur WILLY COPPENS, Air Attaché to the Belgian Embassy, has returned to London from Brussels.



TUT-ANKH-AMEN'S BATTLEPLANE

Drawn from Plans found during the recent Excavations.

From the original by Geo. Tharratt.



# THE ROYAL AIR FORCE

London Gazette, February 13, 1923.

## General Duties Branch.

Flying Offr. (Hon. Flight Lieut.) W. L. Payne is granted permanent commn. as Flying Offr.; Nov. 9, 1922. Flight Lieut. C. O. F. Modin, D.S.O., is granted permanent commn. in rank stated; Oct. 10, 1919. Since promoted. *Gazette*, Oct. 10, 1919, appointing him to a short-service commn. is cancelled. Squadron Ldr. G. H. Thomson, O.B.E. (Paymr. Cdr., R.N.) to be honorary Wing Comdr.; Jan. 28. Wing Comdr. C. T. Maclean, D.S.O., M.C., is placed on half-pay, Scale A, from Jan. 19 to Feb. 1, inclusive (substituted for *Gazette*, Jan. 19); Flying-Offr. A. J. Barlow relinquishes his short service commn. on account of ill-health, and is granted rank of Capt. (Feb. 14); Flying-Offr. W. E. Windover is removed from R.A.F. His Majesty having no further use for his services (Feb. 2). The names of Flying-Offr. Arthur Leslie Moore are as now described, and not as *Gazette* Nov. 7, 1922.

## Stores Branch.

The following are granted short-service commns. in ranks stated for three years' service on active list, with seny. as indicated in brackets (Jan. 26). Squadron Ldr. A. Burtenshaw, O.B.E., M.C. (April 1, 1918). Flying Offrs.: A. E. M. Dredge, M.B.E. (April 1, 1918) (immediately following Flying Offr. F. R. Berresford). F. S. Moore (Feb. 28, 1920). Flying Offr. S. H. Atherly resigns his short-service commn. (Aug. 18, 1922) (substituted for *Gazette*, Sept. 8, 1922).

## Medical Branch.

G. R. Nodwell, M.B., is granted short-service commn. as Flying Offr., with effect from and with seny. of, Jan. 29.

## Chaplains' Branch.

The Rev. H. Thomas, B.A., is granted short-service commn., with relative rank of Squadron Ldr.; Jan. 1.

## ROYAL AIR FORCE INTELLIGENCE

**Appointments.**—The following appointments in the Royal Air Force are notified:—

**Wing Commander:** C. T. Maclean, D.S.O., M.C., from Half-pay List to R.A.F. Depot (Inland Area) (Supernumerary). 2.2.23.

**Squadron Leaders:** R. B. Ward, A.F.C., from School of Naval Co-operation and Aerial Navigation (Coastal Area) to Aeronautical Committee of Guarantee, Germany. For duty with British Section. 17.1.23. A. J. Miley, O.B.E., from R.A.F. Depot (Inland Area) to command No. 267 Squadron (Mediterranean). 6.2.23. A. H. Peck, D.S.O., M.C., from No. 2 Flying Training School (Inland Area) to command No. 25 Squadron (Constantinople Wing). 6.2.23. A. N. Gallehawk, A.F.C., from R.A.F. Base, Leuchars (Coastal Area) to Headquarters, Coastal Area (Supernumerary). 14.2.23. H. E. Rowley, from Headquarters, R.A.F. Cranwell to Inland Area Aircraft Depot. 14.2.23. F. C. Williams, O.B.E., from R.A.F. Depot (Inland Area) to Headquarters, R.A.F. Cranwell. 9.2.23. W. F. Bryant, from Headquarters, R.A.F. Mediterranean to Headquarters, Coastal Area. 27.1.23.

**Flight Lieutenants:** R. E. Nicoll, from Headquarters, R.A.F. Iraq to No. 8 Squadron (Iraq). 16.8.22. T. Henderson, M.C., A.F.C., from No. 100

Squadron (Inland Area) to R.A.F. Depot (Inland Area) (Supernumerary) 2.2.23. The notification concerning this officer which appeared in R.A.F. Bulletin No. 104 dated 9.2.23 is hereby cancelled. W. T. S. Williams, D.S.C., from Air Ministry (Dept. of A.M.P.) (D.D.O.) to R.A.F. Depot (Inland Area) (Supernumerary). 14.2.23. The Hon. J. H. B. Rodney, M.C., from No. 24 Squadron (Inland Area) to Air Ministry (Dept. of A.M.P.) (D.D.O.). 14.2.23. R. H. Cleverly, from No. 11 Squadron (Inland Area) to Electrical and Wireless School (Inland Area). 22.1.23. A. Durston, A.F.C., from H.M.S. *Argus* (Coastal Area) to No. 267 Squadron (Mediterranean). 5.1.23. J. A. Sadler, from H.M.S. *Argus* (Coastal Area) to H.M.S. *Ark Royal* (Mediterranean). 13.10.22. W. R. Curtis, from H.M.S. *Argus* (Coastal Area) to H.M.S. *Ark Royal* (Mediterranean). 17.11.22.

**Captains:** A. H. K. Jackson, D.S.O., M.C. (R. War. Reg.) to Headquarters, R.A.F., Iraq. On attachment to Royal Air Force. For duty as G.S.C., 3rd Grade, at Basrah Group Headquarters (on formation). 21.9.22. A. H. K. Jackson, D.S.O., M.C. (R. War. Reg.), from Headquarters, Iraq Command to Basrah Group Headquarters (Iraq Command). For duty as Liaison Officer (G.S.O., 3rd Grade). 1.10.22.

## IN PARLIAMENT

### Subsidised Air Services

LIEUT.-COLONEL NALL on February 15 asked the Secretary of State for Air whether the pilots and technical personnel employed in subsidised air services are under any binding obligation to serve the State in any emergency?

Lieut.-Colonel Sir Samuel Hoare: No, Sir, but it is hoped that the majority will join the Air Force Reserve.

Lieut.-Colonel Nall: Will these personnel be told that they must join that Reserve?

Sir S. Hoare: The contract, for which I am not responsible, has still some months to run. I will certainly consider this point if the contracts are renewed when they run out.

Capt. Wedgwood Benn: Would the same conditions apply to subsidies given to airships?

Sir S. Hoare: There are no contracts for any airships. I do not think the hon. and gallant gentleman's question arises.

### Civil Aviation

CAPT. W. BENN asked when the next report on civil aviation will be published?

Sir S. Hoare: For reasons of economy it has been decided to publish annual instead of half-yearly reports on the progress of civil aviation. The next report will, therefore, cover the period, April 1, 1922, to March 31, 1923, and will be published as soon as possible after the last-mentioned date.

### Navy and Army Air Forces

COMMANDER BELLAIRS on February 18 asked the Prime Minister whether

a Committee has yet reported on the question of the full control by the Navy and Army of the Air Forces which work with them; and whether the Cabinet has come to any decision?

The Prime Minister: The question of co-operation between the Services is at present under consideration.

Commander Bellairs: Can we have any indication when we shall have a decision on this subject?

The Prime Minister: I cannot say.

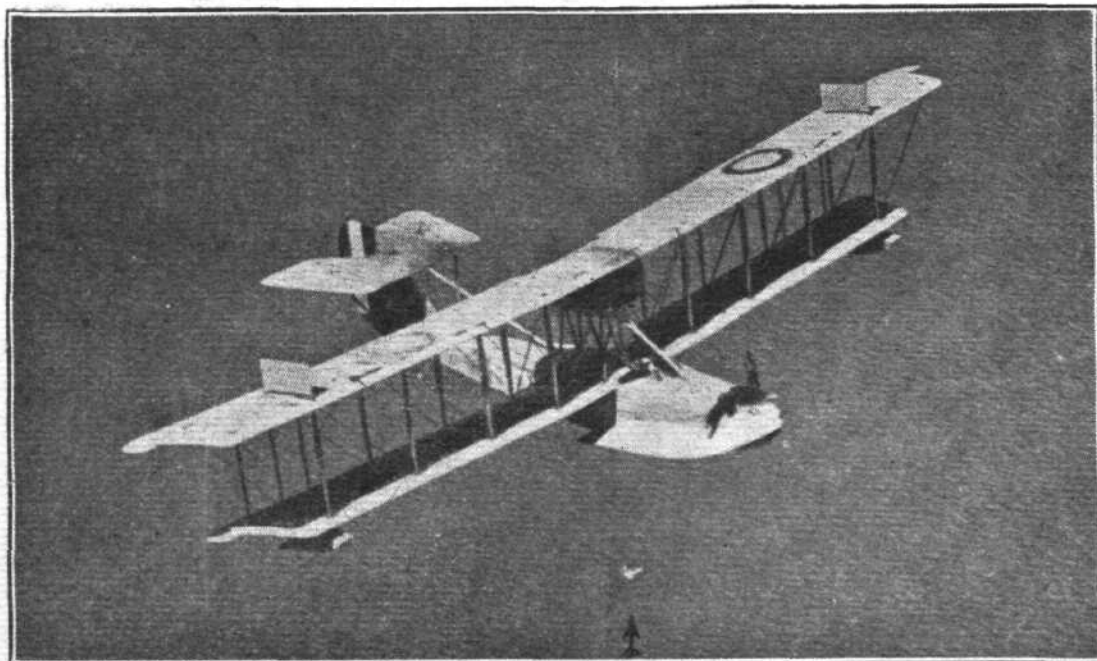
Commander Bellairs asked the Prime Minister if there is any other great naval or military Power in the world other than Great Britain which does not make its naval and military authorities completely responsible for their own naval and military requirements in air personnel and material?

The Prime Minister: Great Britain is, so far as I am aware, the only Power which at present maintains an Air Force as a separate Service, though the adoption of a similar course is, I understand, supported by a strong body of opinion in several other countries, notably France and the United States.

### Aircraft Action

MR. D. GRENFELL asked the Under-Secretary of State for the Colonies whether the alleged bombing of native villages in Mesopotamia is authorised by his Department as a method of inducing the native population to pay taxes?

Mr. Ormsby-Gore: There is no foundation for the suggestion that bomb-dropping or other offensive action by aircraft is resorted to in Iraq for the purpose of enforcing payment of taxes or in punishment of non-payment.



An Interesting Picture from America: A U.S. Navy Patrol Flying Boat releasing a Carrier Pigeon whilst in flight over the sea. The pigeon, just below the bow of the boat, is indicated by the arrow-head.

## HONOURS

AMONGST the Prime Minister's list of Political Honours, announced on February 8, is that of Knighthood conferred upon:—

COMMANDER WALTER GEORGE WINDHAM, for public and political services. Commander Windham was the founder of the Aeroplane Club, and originated the first aerial post of India and in this country. He was also one of the first to form the Motor Reserve, and established the first motor ploughing school under Government supervision in 1917.

On February 15, at Buckingham Palace, His Majesty the King conferred the honour of Knighthood upon Mr. Edward Manville, M.P., for services to the Board of Trade.

The King also conferred the decoration of the Albert Medal upon Squadron Leader Charles Darley, R.A.F. On the night of September 27, 1919, a Vickers-Vimy aeroplane, piloted by Capt. Cecil Hill Darley, brother of Squadron Leader (then Flight Lieut.) Darley, who was acting as Navigation Officer, made a forced landing by Lake Bracciano, some twenty miles north of Rome, when on a flight from England to Egypt. On the following morning in taking off, the aeroplane failed to clear a telegraph pole and crashed, immediately bursting into flames. Squadron Leader Darley was thrown clear, but at once rushed to the blazing wreckage and displayed very conspicuous bravery and devotion in persistent, but unavailing, attempts to rescue his brother, who was pinned in the pilot's seat. His efforts to release his brother were only brought to an end by his collapse. He sustained such severe burns that he was a patient in hospital for over eighteen months.

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## SIDE-WINDS

AMONG the exhibits at the British Industries Fair, is one of the famous "Tabloid" first-aid outfits specially designed by Messrs. Burroughs Wellcome and Co., for flying men. Made of aluminium and occupying only a few cubic inches of space, this little outfit is easily carried either in the pocket or on the "plane," and it provides everything for rendering first-aid in those little mishaps to which every flier is liable. "Tabloid" outfits suitable for the hangar are also shown, larger in size but marvels of compression and convenience. The "Tabloid" first-aid equipments have been carried by practically all our famous flying men on their most notable flights. Many other items such as the "Tabloid" developers and other photographic chemicals, shown at Messrs. Burroughs Wellcome and Co.'s exhibits will also appeal to the man who flies.

SHORT BROS. (ROCHESTER AND BEDFORD), LTD., have registered the word "Metoplane" as a trade mark in connection with the all-metal aircraft manufactured by them.

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### Sadi Gets It Once More.

On Thursday morning last, at Istres Aerodrome, Sadi Lecoq made a successful attempt at regaining the World's Speed Record, when he averaged for the four km. 375.132 km.p.h. (233.107 m.p.h.), thus beating Gen. Mitchell's record by a little under 10 m.p.h. His times for each km. were as follows:—(1) 9½ secs. (391.304 km.p.h.); (2) 10 secs. (360 km.p.h.); (3) 9½ secs. (382.978 km.p.h.); (4) 9½ secs. (367.346 km.p.h.). He was flying the Nieuport, fitted with a 400 h.p. Hispano-Suiza engine, and wing radiators. His landing speed was in the neighbourhood of 112 m.p.h.!

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### IMPORTS AND EXPORTS, 1922-1923

AEROPLANES, airships, balloons and parts thereof (not shown separately before 1910). For 1910 and 1911 figures see "FLIGHT" for January, 25, 1912; for 1912 and 1913, see "FLIGHT" for January 17, 1914; for 1914, see "FLIGHT" for January 15, 1915; for 1915, see "FLIGHT" for January 13, 1916; for 1916, see "FLIGHT" for January 11, 1917; for 1917, see "FLIGHT" for January 24, 1918; for 1918, see "FLIGHT" for January 16, 1919; for 1919, see "FLIGHT" for January 22, 1920; for 1920, see "FLIGHT" for January 13, 1921; for 1921, see "FLIGHT" for January 19, 1922; and for 1922 see "FLIGHT" for January 18, 1923.

	Imports		Exports		Re-Exports	
	1922.	1923.	1922.	1923.	1922.	1923.
Jan. ..	£ 1,152	£ 466	£ 76,552	£ 60,079	£ 23	£ 280

## PUBLICATIONS RECEIVED

*British Industries Fair, 1923. February 19-March 2. London: Department of Overseas Trade, 35, Old Queen Street, S.W. 1. Price 1s.*

*British Standard Glossary of Aeronautical Terms. British Engineering Standards Association: No. 185.—1923. London: Crosby Lockwood and Son. Price 1s. By post 1s. 5d.*

*Department of Overseas Trade. Report on the Commercial Situation in Siam, Third Quarter, 1922. By T. H. Lyle, C.M.G. London: H.M. Stationery Office, Kingsway, W.C. 2. Price 1s. 6d. net; by post, 1s. 7½d.*

*No. 772. Model Tests of 64 Section Biplane Wings with Flaps. By F. B. Bradfield. October, 1921. H.M. Stationery Office, Kingsway, W.C. 2. Price 6d. net; by post, 6½d.*

*Revue Juridique Internationale de la Locomotion Aérienne. January, 1923. Edition Aérienne, 4 Rue Tronchet, Paris.*

*Atti dell' Associazione Italiana di Aerotecnica, 1920-21. Vol. I. Associazione Italiana di Aerotecnica, Lungotevere Michelangelo, 10, Rome. Price 20 lire.*

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## NEW COMPANIES REGISTERED

AIRCRAFT OPERATING CO., LTD., 11, New Court, Carey Street, W.C.—Capital £6,000, in £1 shares. Objects: to secure and carry out contracts in any part of the world for aerial surveys, for the management, operation or agency works of air lines, and for the carrying of passengers, freight, mails, etc., for the equipping of aircraft expeditions for governments and others, etc. First directors: A. S. Butler, H. Hemming, T. P. Mills.

SEAPLANE AND PLEASURE TRIP CO., LTD.—Capital £300, in 1s. shares. Carriers of passengers by seaplane, airship, aeroplane, etc. First directors, H. P. Willsher and E. O. Cohen. Secretary, Miss O. Whiteley, Mersey Motor Works, Concannon Road, Acre Lane, Brixton, S.W. 2.

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## AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: cyl. = cylinder; I.C. = internal combustion; m. = motor. The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

### APPLIED FOR IN 1921

Published February 22, 1923.

- 19,607. INTERNATIONAL ALL-STEEL AIRCRAFT SYND., LTD. Aircraft. (173,206.)
- 28,048. V. L. OIL PROCESSES, LTD., and O. D. LUCAS. Parachutes. (192,136.)
- 28,234. SOC. ANON. DES ATELIERS D'AVIATION L. BRÉGUET. Process for manufacture of a light sheet metal warpable surface. (172,934.)
- 28,700. SOC. ANON. DES ATELIERS D'AVIATION L. BRÉGUET. Controlling means for aeroplanes. (173,219.)
- 29,253. A. M. BOURKE. Screw-propeller blades. (192,189.)
- 29,637. M. J. B. BARBAROU. Reducing-gear for aviation engines. (171,382.)
- 32,961. H. O. SHORT. Aircraft propellers. (192,245.)

### APPLIED FOR IN 1922.

Published February 22, 1923.

- 121. H. O. SHORT. Hydro-aeroplanes. (192,264.)

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